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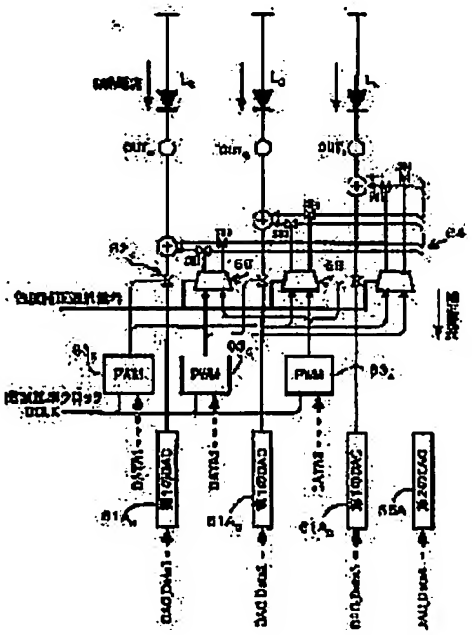
(54) PICTURE DISPLAY DEVICE, AND METHOD FOR CONTROLLING PICTURE DISPLAY AND PICTURE DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To realize a picture display device having high reproducibility and a control method therefor by correcting irregularity of chromaticity of light emitting elements and uniformalizing a color tone of each pixel.
SOLUTION: The picture display device comprises a display part 10 in which light emitting elements of a plurality of color tones are arranged for each pixel, a driving part 50 for supplying a driving current to each light emitting element of a plurality of color tones for each pixel based on the picture data concerning a plurality of the color tones, and a chromaticity correction part 11 for distributing a predetermined part of the driving current supplied to a light emitting element corresponding to at least any one of the color tones of each pixel from the driving part 50 to a light emitting element corresponding to the other one or more color tones of the pixel.



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CLAIMS

[Claim(s)]
[Claim 1] The 1st current adjustment section for adjusting the drive current by which comes to arrange the light emitting device of two or more color tones for every pixel, and it is supplied to said each of light emitting device of two or more color tones for every pixel based on the image data about two or more color tones (61R, 61G, 61B), In order to amend the color tone of said light emitting device corresponding to any one color tone at least among two or more color tones of each pixel It is an image display device equipped with the 2nd current adjustment section (65) for adjusting the amendment current supplied to the light emitting device corresponding to other one or more color tones of this pixel. In case 1 image frame which makes VSYNC a frame signal is divided into plurality, and is used as an image transfer frame and image display actuation is performed based on the same image data with each image transfer frame, it sets on the image transfer frame of at least 1. While supplying the amendment current for amending the color tone of the light emitting device of any one color tone to the light emitting device of any other one color tone The image display device characterized by constituting and becoming so that color tone amendment to the light emitting device of two or more color tones by changing the amendment current supplied to any other one light emitting device in order to amend the color tone of any one light emitting device for every image transfer frame may be realized by time sharing.
[Claim 2] The image display device according to claim 1 with which the color tone of said light emitting device is characterized by to be red and being green and blue.
[Claim 3] Said image display device is an image display device according to claim 1 or 2 further characterized by performing brightness amendment of each light emitting device.
[Claim 4] Said 1st current adjustment section (61) is an image display device according to claim 1 to 3 with which the 1st current adjustment section (61) of 1 supplies a drive current to the light emitting device of the color tone of 1, and said 2nd current adjustment section (65) is characterized by the 2nd current adjustment section (65) of 1 supplying an amendment current to the light emitting device of two or more color tones.
[Claim 5] The image display device according to claim 1 to 4 characterized by enabling a setup of whether have set on the number of the image transfer frames which divided the image frame, and which image transfer frame, and an amendment current is supplied to the light emitting device of the color tone of a gap.
[Claim 6] The image display device according to claim 1 to 5 characterized by for said 1st current adjustment section (61) being the 1st current adjustment DA converter (61AR, 61AG, 61AB), and said 2nd current adjustment section (65) being the 2nd current adjustment DA converter (65A).
[Claim 7] The lighting pulse generation section of at least 1 to which said image display device generates further the lighting pulse which controls luminescence of said light emitting device, respectively (63R, 63G, 63B), Two or more main current switches with which ON/OFF is controlled by said lighting pulse generation section (63R, 63G, 63B), respectively (62R, 62G, 62B), Two or more amendment current switches for adjusting an amendment current (SW 1-6), It has the switch control section (66, 66, 66) which carries out ON/OFF control of said amendment current switch (SW 1-6). Said 1st current adjustment section (61R, 61G, 61B) The drive current supplied to each light emitting device through said main current switch (62R, 62G, 62B) is adjusted. Said 2nd current adjustment section (65) 5 is [claim 1 characterized by adjusting the amendment current supplied to each light emitting device through said amendment current switch (SW 1-6), adding an amendment current to a drive current, and performing color tone amendment for every light emitting device thru/or] the image display device of a publication either.
[Claim 8] Said lighting pulse generation section (63R, 63G, 63B) is an image display device according to claim 7 which carries out Pulse Density Modulation of the gradation data, and controls the lighting section based on a gradation reference clock.
[Claim 9] The image display device according to claim 7 or 8 to which said switch control section (66, 66, 66) performs ON/OFF control of said amendment current switch (SW 1-6) with a color tone amendment selection signal.

[Claim 10] It comes to arrange the light emitting devices LR, LG, and LB corresponding to two or more color tones RGB for every pixel. It is based on the image data DR, DG, and DB about RGB. For every pixel Said light emitting device LR It is the image display control approach which carries out multicolor luminescence by controlling each amount AR, AG, and AB of luminescence of LG and LB. In case 1 image frame which makes VSYNC a frame signal is divided into plurality, and is used as an image transfer frame and image display actuation is performed based on the same image data with each image transfer frame, it sets on the image transfer frame of at least 1. The light emitting device Li (i=R) concerning any one color tone at least among RGB of each pixel In case G and B emit light based on image data Di, while making the light emitting device Lk (k!=i) of other one or more color tones of this pixel emit light in the amount Ak of luminescence according to image data Dk A light emitting device Lk is made to emit light by amount A'k of luminescence further according to the amount Ai of luminescence of said light emitting device Li. The amount of luminescence of a light emitting device Lk is made into Ak+A'k. Further addition of amount A'k of luminescence for amendment In order to amend any one color tone within the image transfer frame of 1, while making the light emitting device of others and any one color tone emit light by amount A'k of luminescence The image display control approach which constitutes and becomes by changing amount A'k of luminescence which makes any other one light emitting device emit light in order to amend the color tone of any one light emitting device for every image transfer frame so that color tone amendment to the light emitting device of two or more color tones may be realized by time sharing.

[Claim 11] The 1st current adjustment section for adjusting the drive current by which comes to arrange the light emitting device of two or more color tones for every pixel, and it is supplied to said each of light emitting device of two or more color tones for every pixel based on the image data about two or more color tones (61R, 61G, 61B), In order to amend the color tone of said light emitting device corresponding to any one color tone at least among two or more color tones of each pixel It is the control approach of the image display device which amends the brightness and color tone of an image display device equipped with the 2nd current adjustment section (65) for adjusting the amendment current supplied to the light emitting device corresponding to other one or more color tones of this pixel. The brightness and color tone calculation process which computes the brightness and color tone of a light emitting device corresponding to each color tone of said display for every pixel with the luminescence detector on the strength which has a photo detector corresponding to two or more color tones, The brightness and color tone difference calculation process which compares with criteria brightness and a criteria color tone the brightness of the light emitting device corresponding to each color tone computed for every pixel in said brightness and color tone calculation process, and a color tone, and computes the brightness difference and a color tone difference, While adjusting said drive current supplied to the light emitting device corresponding to each color tone by said 1st current adjustment (61R, 61G, 61B) By adjusting said amendment current supplied based on the brightness difference and color tone difference which were computed in said brightness and color tone difference calculation process in said 2nd current adjustment section (65), and adding to said drive current In the amendment process which amends each pixel brightness and a color tone to criteria brightness and a criteria color tone, and said amendment process The amendment data storage process of storing in said image display device the amendment data about control of the drive current supplied to said light emitting device of each color tone for every pixel, In case 1 image frame which makes VSYNC a frame signal is divided into plurality, and is used as an image transfer frame and image display actuation is performed based on the same image data with each image transfer frame, it sets on the image transfer frame of at least 1. It is the process which supplies the amendment current which performs the brightness and color tone amendment based on said amendment data to the light emitting device corresponding to one or more color tones besides the above, and is added to said drive current. While supplying the amendment current for amending the color tone and brightness of a light emitting device of any one color tone within the image transfer frame of 1 to the light emitting device of any other one color tone the process which performs the color tone amendment and brightness amendment to a light emitting device of two or more color tones by changing the amendment current supplied to any other one light emitting device by time sharing in order to amend the color tone of any one light emitting device for every image transfer frame — since — the control approach of the becoming image display device.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the image display device which equipped the detail with the function which amends the amount of luminescence according to property dispersion of a light emitting device, and its control approach about the image display device with which the light emitting device of two or more color tones has been arranged for every pixel, and its control approach.
[0002]
[Description of the Prior Art] The red (Red) whose light emitting devices of high brightness, such as light emitting diode (referred to also as "LED" Light Emitting Diode and the following.), are the three primary colors of light, and since it was developed per each RGB of green (Green) and blue (Blue), a large-sized spontaneous light type full color display came to be produced today. Since it has the descriptions, like a light weight and thin-shape-izing are possible for a LED display inside, and power consumption is low, also outdoors, need is increasing rapidly as an usable large-sized display.
[0003] In the case of a large-sized LED display which is installed in the outdoors, it is constituted by generally combining two or more LED units, and each part of full-screen data is displayed on each LED unit. The light emitting diode which makes RGB a lot on a substrate is arranged in the shape of a pixel matrix, and each LED unit performs the same actuation as an above-mentioned LED display to an LED unit. In a large-sized LED display with big size, LED of about 300,000 pixels of sum totals beside [640] vertical 300x is used, for example. Moreover, this 1 pixel is constituted from the combination of LED of 3 or more dots which emits light to R, G, and B by the full color LED display, respectively.
[0004] Generally as a drive method of an LED unit, the dynamic drive method is used. For example, in the case of the LED display constituted in the shape of [of a m line xn train] a matrix, the anode terminal of LED located in each line is connected common to one common source line, and the cathode terminal of LED located in each train is connected common to one current Rhine. Sequential ON of the common source line whose m lines are is carried out with a predetermined period, and a drive current is supplied to n ****** current Rhine according to the image data corresponding to turned-on Rhine. The drive current according to the image data is impressed to LED of each pixel by this, and an image is displayed.
[0005] In order to reproduce image data on a LED display correctly, it is needed that the optical output properties (drive current-brightness property etc.) of each LED are uniform. However, the LED component actually manufactured does not have homogeneous all. Although an LED component is formed on a wafer of a semi-conductor manufacturing technology, dispersion in an optical output property or an emission spectrum arises with a manufacture lot, a wafer, or a chip. For this reason, according to dispersion in the LED property of each pixel, for example, dispersion of brightness or a chromaticity, it is necessary to amend the magnitude of the drive current corresponding to each image data.
[0006] As an amendment means of image data, the method of performing for example, brightness amendment is developed (approach indicated by the patent official report No. 2950178). For example, by making the drive current of the amount according to dispersion in the optical output property of each LED fluctuate, even if it is which LED, there is the approach of amending so that the same optical output may be obtained to the image data input of the same value.
[0007] Or a quality image is displayed using the image data which carried out brightness amendment for every LED component. The amendment data storage section is made to specifically memorize the brightness amendment data corresponding to each LED component in the control circuit which controls lighting of a LED display, respectively. As this amendment data storage section, ROM is used, for example. A control circuit amends and displays image data based on the amendment data stored in ROM.
[0008]

[Problem(s) to be Solved by the Invention] However, by the above-mentioned approach, all, even if it can amend brightness, it cannot amend a chromaticity. As for an LED component, not only brightness but dispersion of a chromaticity exists for every component. For this reason, even if it performed only brightness amendment and equalized the brightness between pixels, the chromaticity for every pixel could not be amended, but since a color tone varied, it became the sensibility with which the display image was rough, and there was a problem that the quality of a display image deteriorated. Dispersion in a chromaticity becomes remarkable, so that there is much color number used especially. In order to express the image of high quality as the full color display using RGB, not only brightness amendment but chromaticity amendment becomes important.

[0009] This invention is made in view of such a trouble. Even if the important purpose of this invention is an image display device which uses the light emitting device as which dispersion in a property is regarded, it is to offer the image display device in which image display is possible and its control approach of high quality with the sufficient repeatability equalized by performing chromaticity amendment of the light emitting device of each color.

[0010]

[Means for Solving the Problem] In order to attain the above purpose, the image display device indicated by claim 1 of this invention The 1st current adjustment section 61R, 61G, and 61B for adjusting the drive current by which comes to arrange the light emitting device of two or more color tones for every pixel, and it is supplied to said each of light emitting device of two or more color tones for every pixel based on the image data about two or more color tones, In order to amend the color tone of said light emitting device corresponding to any one color tone at least among two or more color tones of each pixel, it has the 2nd current adjustment section 65 for adjusting the amendment current supplied to the light emitting device corresponding to other one or more color tones of this pixel. This image display device 1 image frame which makes VSYNC a frame signal In case it divides into plurality, it considers as an image transfer frame and image display actuation is performed based on the same image data with each image transfer frame, it sets on the image transfer frame of at least 1. While supplying the amendment current for amending the color tone of the light emitting device of any one color tone to the light emitting device of any other one color tone In order to amend the color tone of any one light emitting device for every image transfer frame, it is characterized by constituting and becoming so that color tone amendment to the light emitting device of two or more color tones by changing the amendment current supplied to any other one light emitting device may be realized by time sharing.

[0011] Thus, by constituting, it cannot be concerned with chromaticity dispersion of a light emitting device, but the image display device which can make the chromaticity for every pixel homogeneity can be offered.

[0012] Moreover, by this configuration, a chromaticity can be amended by making the light emitting device corresponding to other one or more color tones emit light, and a flicker of a display can be prevented so that the luminescent chromaticity of that color tone may be amended at least among two or more color tones during luminescence of said light emitting device corresponding to any one color tone.

[0013] Moreover, in addition to the description the image display device indicated by claim 2 of this invention is indicated to be by said claim 1, the color tone of said light emitting device is characterized by to be red and being green and blue.

[0014] Furthermore, the image display device indicated by claim 3 of this invention is characterized by performing brightness amendment of each light emitting device.

[0015] Moreover, in the image display device indicated by claim 4 of this invention, the 1st current adjustment section 61 of 1 supplies a drive current to the light emitting device of the color tone of 1, and said 1st current adjustment section 61 is characterized by said 2nd current adjustment section 65 supplying an amendment current to the light emitting device of the color tone of plurality [section / 65 / of 1 / 2nd / current adjustment].

[0016] Next, the image display device indicated by claim 5 of this invention is characterized by enabling a setup of whether have set on the number of the image transfer frames which divided the image frame, and which image transfer frame, and an amendment current is supplied to the light emitting device of the color tone of a gap.

[0017] Furthermore, in the image display device indicated by claim 6 of this invention, said 1st current adjustment section 61 is 1st current adjustment DA converter 61AR, 61AG, and 61AB, and it is characterized by said 2nd current adjustment section 65 being the 2nd current adjustment DA converter65A.

[0018] Furthermore, the image display device indicated by claim 7 of this invention The lighting pulse generation sections 63R, 63G, and 63B of at least 1 which generates the lighting pulse which controls luminescence of said light emitting device, respectively, Two or more main current switches 62R, 62G, and 62B with which ON/OFF is controlled by said lighting pulse generation sections 63R, 63G, and 63B, respectively, It has the switch control sections 66, 66, and 66 which carry out ON/OFF control of two or more amendment current switches 1-SW 6

and said amendment current switches SW 1-6 for adjusting an amendment current. This image display device said 1st current adjustment section 61R, 61G, and 61B The drive current supplied to each light emitting device through said main current switches 62R, 62G, and 62B is adjusted. Said 2nd current adjustment section 65 It is characterized by adjusting the amendment current supplied to each light emitting device through said amendment current switches 1-SW 6, adding an amendment current to a drive current, and performing color tone amendment for every light emitting device.

[0019] Moreover, in the image display device indicated by claim 8 of this invention, said lighting pulse generation sections 63R, 63G, and 63B are characterized by carrying out Pulse Density Modulation of the gradation data, and controlling the lighting section based on a gradation reference clock.

[0020] Moreover, in the image display device indicated by claim 9 of this invention, said switch control sections 66, 66, and 66 are characterized by performing ON/OFF control of said amendment current switches 1-SW 6 with a chromaticity amendment selection signal.

[0021] Furthermore, when it comes to arrange the light emitting devices LR, LG, and LB corresponding to two or more color tones RGB for every pixel and they control each amount AR, AG, and AB of luminescence of said light emitting devices LR, LG, and LB for every pixel based on the image data DR, DG, and DB about RGB, multicolor luminescence of the image display control approach indicated by claim 10 of this invention is carried out. This image display control approach 1 image frame which makes VSYNC a frame signal In case it divides into plurality, it considers as an image transfer frame and image display actuation is performed based on the same image data with each image transfer frame, it sets on the image transfer frame of at least 1. The light emitting device Li (i=R) concerning any one color tone at least among RGB of each pixel In case G and B emit light based on image data Di, while making the light emitting device Lk (k!=i) of other one or more color tones of this pixel emit light in the amount Ak of luminescence according to image data Dk A light emitting device Lk is made to emit light by amount A'k of luminescence further according to the amount Ai of luminescence of said light emitting device Li. The amount of luminescence of a light emitting device Lk is made into Ak+A'k. Further addition of amount A'k of luminescence for amendment In order to amend any one color tone within the image transfer frame of 1, while making the light emitting device of others and any one color tone emit light by amount A'k of luminescence By changing amount A'k of luminescence which makes any other one light emitting device emit light, in order to amend the color tone of any one light emitting device for every image transfer frame, it constitutes and becomes so that color tone amendment to the light emitting device of two or more color tones may be realized by time sharing.

[0022] The control approach of the image display device indicated by claim 11 of this invention further again The 1st current adjustment section 61R, 61G, and 61B for adjusting the drive current by which comes to arrange the light emitting device of two or more color tones for every pixel, and it is supplied to said each of light emitting device of two or more color tones for every pixel based on the image data about two or more color tones, In order to amend the color tone of said light emitting device corresponding to any one color tone at least among two or more color tones of each pixel The brightness and color tone of an image display device equipped with the 2nd current adjustment section 65 for adjusting the amendment current supplied to the light emitting device corresponding to other one or more color tones of this pixel are amended. The control approach of this image display device with the luminescence detector on the strength which has a photo detector corresponding to two or more color tones The brightness and color tone calculation process which computes the brightness and color tone of a light emitting device corresponding to each color tone of said display for every pixel, The brightness and color tone difference calculation process which compares with criteria brightness and a criteria color tone the brightness of the light emitting device corresponding to each color tone computed for every pixel in said brightness and color tone calculation process, and a color tone, and computes the brightness difference and a color tone difference, While adjusting said drive current supplied to the light emitting device corresponding to each color tone by said 1st current adjustment 61R, 61G, and 61B By adjusting said amendment current supplied based on the brightness difference and color tone difference which were computed in said brightness and color tone difference calculation process in said 2nd current adjustment section 65, and adding to said drive current In the amendment process which amends each pixel brightness and a color tone to criteria brightness and a criteria color tone, and said amendment process The amendment data storage process of storing in said image display device the amendment data about control of the drive current supplied to said light emitting device of each color tone for every pixel, In case 1 image frame which makes VSYNC a frame signal is divided into plurality, and is used as an image transfer frame and image display actuation is performed based on the same image data with each image transfer frame, it sets on the image transfer frame of at least 1. It is the process which supplies the amendment current which performs the brightness and color tone amendment based on said amendment data to the light emitting device corresponding to one or more color tones besides the above, and is added to said drive current. While supplying the

amendment current for amending the color tone and brightness of a light emitting device of any one color tone within the image transfer frame of 1 to the light emitting device of any other one color tone In order to amend the color tone of any one light emitting device for every image transfer frame, it consists of a process which performs the color tone amendment and brightness amendment to a light emitting device of two or more color tones by changing the amendment current supplied to any other one light emitting device by time sharing.
[0023]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained based on a drawing. However, the gestalt of operation shown below does not illustrate the image display device and its control approach for materializing the technical thought of this invention, and this invention does not specify an image display device and its control approach as the following.
[0024] Furthermore, this specification has appended the number corresponding to the member shown in the gestalt of operation to the member shown in "the column of a claim", and "the column of The means for solving a technical problem" so that it may be easy to understand a claim. However, there is never nothing what specifies the member shown in a claim as the member of the gestalt of operation.
[0025] The image display control approach of this invention is explained below. This approach is the image display control approach which carries out multicolor luminescence, when the light emitting devices LR, LG, and LB corresponding to two or more color tones RGB control each amount AR, AG, and AB of luminescence of said light emitting devices LR, LG, and LB for every pixel based on the image data DR, DG, and DB concerning RGB in the display 10 arranged for every pixel.
[0026] LED etc. is used for a light emitting device. RGB of red, green, and blue adjoins per three pieces, arranges each light emitting diode which can emit light, respectively, and constitutes 1 pixel from the following examples. LED which RGB was made to adjoin for every pixel can realize a full color display. This invention is not restricted to this configuration, but approaching and arranging two colors can also merely arrange two or more LED per Isshiki.
[0027] An example of the pixel which consisted of light emitting devices LR, LG, and LB corresponding to two or more color tones RGB which can be set to drawing 1 at a display 10 is shown. although here showed the example which 1 pixel consists of with three light emitting diodes corresponding to a picture element (dot) -- RGB -- even if few each, a full color display is attained by consisting of 1 or more dots. In this example, the anode terminal of each light emitting device is connected common to one common source line, and the cathode terminal of the light emitting devices LR, LG, and LB of each RGB is connected to each current Rhine. The amount of luminescence of light emitting devices LR, LG, and LB is controlled by the drive current supplied to for example, current Rhine. Thus, light emitting devices LR, LG, and LB are arranged for every pixel, and it is considering as the display 10, and by the amount of currents and/or drive time amount of a drive current which are supplied to each based on image data DR, DG, and DB, by controlling the amounts AR, AG, and AB of luminescence, multicolor luminescence is carried out and image display control is realized.
[0028] Amount A'k of luminescence of a light emitting device Lk (k!=i) which hits an amended part mentioned later can be made to emit light in the same time amount as the luminescence time amount of a light emitting device Li at this time. However, if it is a time lag within the limits by which an after-image remains in human being's eyes, it is not necessary to make light emit in the same luminescence time amount.
[0029] In order to prevent dispersion in the chromaticity of each pixel resulting from manufacture dispersion of each light emitting device in this invention The light emitting device Li (i=R) concerning any one color tone at least among RGB of each pixel In case G and B are made to emit light based on image data Di, everything but this pixel, making the light emitting device Lk (k!=i) of at least one color tone emit light in the amount Ak of luminescence according to image data Dk -- in addition It controls to make amount A'k of luminescence to a light emitting device Lk according to the amount Ai of luminescence of a light emitting device Li emit light further, to unite and to emit light in amount Ak+A'k of luminescence.
[0030] An example of the control approach of amount A'k of luminescence added to the amount Ak of luminescence to which the light emitting device Lk (k!=i) of one color tone emits light below according to image data Dk is explained.
[0031] In this example, it considers as the amount of luminescence which multiplied Ai by the partition ratio [as opposed to each color tone for amount A'k of luminescence to the light emitting device Lk according to the amount Ai of luminescence of a light emitting device Li]. Here, a partition ratio is expressed that the partition ratios of R and G are bR and bG, respectively. [as opposed to gB gR, and B in the partition ratio of B and R] [as opposed to rG rB, and G in the partition ratio of G and B to R] That is, when the amounts of luminescence of each light emitting device LR, LG, and LB based on image data DR, DG, and DB are AR, AG, and AB, in the image display control approach of this invention, last amount A"R of luminescence of each light emitting device LR, LG, and LB, A"G, and A"B are controlled to become the amount of luminescence which added A'R, A'G, and

A'B to AR, AG, and AB, respectively. Amount A"R of luminescence, A"G, and A"B are expressed with the following formulas.

[0032]

[Equation 1]

$$\begin{bmatrix} A''_R \\ A''_G \\ A''_B \end{bmatrix} = \begin{bmatrix} A_R + A'_R \\ A_G + A'_G \\ A_B + A'_B \end{bmatrix} = \begin{bmatrix} 1 & g_R & b_R \\ r_G & 1 & b_G \\ r_B & g_B & 1 \end{bmatrix} \begin{bmatrix} A_R \\ A_G \\ A_B \end{bmatrix}$$

[0033] Therefore, although the amount Ai (i=R, B, G) of luminescence of each light emitting device Li (i=R, B, G) showed one output characteristics by the conventional image display control approach to the image data Di (i=R, B, G) which corresponds, respectively With the image display control approach of this invention, it is each light emitting device Li (i=R). Amount A"i of luminescence of B and G (i=R, B, G) will not become settled in one output characteristics to the corresponding image data Di (i=R, B, G), but will be dependent also on the amount Ak (k!=i) of luminescence corresponding to the image data Dk (k!=i) of the light emitting device Lk (k!=i) of other color tones.

[0034] Next, an example of the setting approach of amount A'k of luminescence added to the light emitting device Lk according to the amount Ai of luminescence of a light emitting device Li is explained. when light emitting diode (LED) is used as a light emitting device, in order [for example,] to amend chromaticity dispersion resulting from wavelength dispersion or optical output property dispersion of the LED -- image data Di (i=R, B, G) -- the amount of luminescence of the light emitting device Lk (k!=i) of other color tones is set up so that the chromaticity of the pixel corresponding to each maximum may be made into a criteria chromaticity. It is desirable to choose three chromaticities which can be expressed as a criteria chromaticity to all the combination of production dispersion of LED of each RGB within the limits here.

[0035] A concrete example of the selection approach of a criteria chromaticity is explained using the chromaticity diagram of drawing 2 . Field deltaSi (i=R, B, G) which shows the range of chromaticity dispersion at the time of making LED of each RGB emit light in the amount AiMax of the maximum luminescence (i=R, B, G) according to the maximum DiMax of the image data of the color tone corresponding to the chromaticity-diagram top of drawing 2 (i=R, B, G) is drawn. At drawing 2 , each field deltaSi is typically displayed with the polygon. At this time, it is possible that all LED is distributed in this deltaSi field (field shown with a slash in drawing 2 , respectively).

[0036] The top-most vertices of this deltaSi field are connected, and a triangle is formed. Top-most vertices where the area of the triangle formed on the intersection of each top-most vertices serves as min from the top-most vertices of deltaSi field of each RGB are chosen. Each top-most-vertices S'R of the minimum triangle **S'RS'GS'B which the intersection of selected top-most vertices forms, S'G, and S'B are chosen as a criteria chromaticity of each RGB. That is, all the chromaticities in triangle **S'RS'GS' area B can be expressed by choosing S'R, S'G, and S'B as a criteria chromaticity.

[0037] Thus, if the criteria chromaticity of each color is set up, the chromaticity of the chromaticity which can be expressed even if it is the combination of which LED within the limits (inside of triangle **S'RS'GS' area B) can be expressed. Amendment of a chromaticity can be performed by making the color of other color tones emit light. By this, chromaticity display dispersion between each pixel can be reduced remarkably, and chromaticity dispersion in the same LED unit 1 can be prevented.

[0038] in drawing 2 , for convenience, since [of explanation] the range of chromaticity dispersion is exaggerated and expressed, the chromaticity range which can be displayed by the display 10 becomes small -- as -- being visible (it reducing to the field of triangle **S'RS'GS'B from the field shown with the wavy line of drawing 2) -- even if it compares a LED display with CRT, it has the property that the color expression range is sufficiently large, and the chromaticity expression range of the display which applied this invention to the LED unit is still large than CRT Moreover, when a chromaticity is amended as an amount of luminescence which multiplied the amount Ai of luminescence for amount A'k of luminescence added to LED of other color tones by the partition ratio, amendment will be continuously performed to all chromaticities within the limits, and chromaticity dispersion can be prevented not only in the field near the RGB but in all color range.

[0039] moreover -- here -- the light emitting device Li (i=R and G --) of each RGB of each pixel In case B) emits light based on image data Di, in the amount Ak of luminescence of the light emitting device according to image data Dk also about the light emitting device Lk (k!=i) of which other color tones of this pixel Although the image display control approach to control was shown as an example so that light might be emitted in amount Ak+A'k of luminescence which added amount A'k of luminescence to the light emitting device Lk according to the amount Ai of luminescence of a light emitting device Li You may control to emit light in amount Ak+A'k of luminescence which added amount A'k of luminescence to the light emitting device Lk according to the amount

Ai of luminescence of Li to the amount Ak of luminescence of the light emitting device according to the image data Dk of the light emitting device Lk (k!=i) of other one or more color tones of this pixel.
[0040] For example, if the color differential threshold on a chromaticity diagram is taken into consideration, since it is insensible to the chromaticity difference of the direction of B as compared with the direction of G, human being's eyes may be controlled by the field of R to emit light in amount AG+A'G of luminescence which added amount A'G of luminescence according to the amount AR of luminescence of LED of R only to LED of G. Moreover, since dispersion in a chromaticity is large as compared with LED of R or B, LED of G which now consists of a gallium nitride system compound semiconductor may be controlled to perform luminescence of R and/or amount A'R of luminescence of LED of B, amount AR+A'R of luminescence that added A'G, and/or AG+A'G only to luminescence of LED of G, as long as dispersion in LED of R and B is small enough. However, human being's eyes may be made to amend a chromaticity from the color differential threshold of area B being small sensitive to a chromaticity difference to LED of B as chromaticity dispersion of LED of B being small even if. Of course, it is not limited to the above-mentioned example whether amendment of the chromaticity of which LED of RGB is omitted, its chromaticity dispersion of the light emitting device of which chromaticity is large, or it can choose suitably according to the configuration of the color differential threshold in the chromaticity field.
[0041] Moreover, said light emitting device LR based on the image data DR, DG, and DB about RGB [when controlling image display by the amount of drive currents and/or drive time amount which supply control of the amounts AR, AG, and AB of luminescence of LG and LB to said light emitting devices LR, LG, and LB] It is desirable to control by increasing the drive current which supplies amount A'k of luminescence added according to the amount Ai of luminescence of a light emitting device Li to a light emitting device Lk to a light emitting device Lk. In each pixel, it is because control of the amount of luminescence is performed to coincidence in the same drive time amount of each light emitting device and a flicker of a display can be suppressed to the minimum.
[0042] Although the example which used LED as a light emitting device was shown here, it is suitable to the image display device which does not limit a light emitting device to LED in this invention, but chromaticity dispersion produces for every light emitting device.
[0043] In addition, when a correlation is between amendment of brightness dispersion, and amendment of chromaticity dispersion and it considers amendment of an image display device, it is important in the case of chromaticity dispersion amendment to perform brightness dispersion amendment to coincidence.
[0044] Light emitting diode can use the semi-conductor light emitting device in which various luminescence is possible. As a semiconductor device, what used semi-conductors, such as GaP, GaAs, GaN, InN and AlN, GaAsP, GaAlAs, InGaN, AlGaN, AlGaInP, and InGaAlN, for the luminous layer is mentioned. Moreover, the thing of terrorism structure is mentioned to the gay structure where the structure of a semi-conductor also has MIS junction, PIN junction, and a PN junction, hetero structure, or double.
[0045] By whenever [ingredient or its mixed-crystal], the luminescence wavelength of a semi-conductor light emitting device can be variously chosen from ultraviolet radiation to infrared light. [of a semi-conductor layer] Furthermore, in order to give the quantum effectiveness, it can also consider as the single quantum well structure and multiplex quantum well structure which used the luminous layer as the thin film.
[0046] The light emitting diode by combination with the fluorescent material which is excited by this not only with the three primary colors of RGB but with the light from an LED chip, and emits light can also be used. In this case, white can consider as the light emitting diode which linearity can be good and can emit light using one kind of light emitting device by using the fluorescent material which it is excited by the light from light emitting diode, and is changed into long wavelength.
[0047] Furthermore, the thing of various configurations can be used for light emitting diode. While specifically connecting electrically the LED chip which is a light emitting device to a lead terminal, the thing using the shell mold covered with mold resin etc., the chip type LED, etc. and the light emitting device itself is mentioned.
[0048]
[Example] Hereafter, the example of a configuration concrete about the gestalt of operation of this invention is explained.
[0049] The rough block diagram of an example of the image display device applied to this invention at [example 1] drawing 3 is shown. The image display device shown in this drawing shows the example applied to the LED unit which displays by dividing one image into two or more image fields. The image display device shown in drawing 3 A display 10 and the amendment data storage section 32, With the amendment data control section 31 connected to the amendment data storage section 32, and the communications department 33 connected to the amendment data control section 31 The current feed zone 14 connected to the amendment data control section 31, and the brightness amendment section 13, It consists of the chromaticity amendment section 11,

the image input section 19 which receives the image data inputted from the outside, the drive time amount control section 12 into which image data is inputted from the image input section 19, the address-generation section 18, and a common driver 17.
[0050] The image display device of the invention in this application can display a dynamic image and a static image by displaying the screen of 30 or more frames as an image frame in 1 second. Rather than the image display which used the Braun tube, the image display device which generally uses a light emitting device makes a refresh rate high, and makes [many] the count of an image frame display per second. In drawing 3 , 10 is the display 10 which displays the image corresponding to the image field specified among the divided image fields. 1 pixel is constituted, two or more pixels are arranged by the combination of each LED of RGB corresponding to three color tones in the shape of [of a m line xn train] a matrix, and a display 10 is constituted.
[0051] The amendment data which need the amendment data storage section 32 for amendment of the brightness of a display 10 and a chromaticity are memorized. As the amendment data storage section 32, storage elements, such as RAM, and a flash memory, EEPROM, are used. Various kinds of amendment data required for image amendment are memorized by the amendment data storage section 32. For example, white balance amendment data and field brightness amendment data required in order to control the predetermined amount of currents supplied for every color tone in the current feed zone 14 which are data, Pixel brightness amendment data required in order to amend brightness for every dot in the brightness amendment section 13, [required in order to amend a chromaticity for every pixel in the chromaticity amendment section 11] The chromaticity amendment data about a part of predetermined drive current which should be distributed to the light emitting device corresponding to other one or more color tones to the drive current supplied to the light emitting device corresponding to one color tone etc. are memorized by the amendment data storage section 32.

[0052] The amendment data control section 31 calls the various amendment data memorized by the amendment data storage section 32, and writes them in the current feed zone 14, the brightness amendment section 13, and the chromaticity amendment section 11, respectively.
[0053] The inputted image data is inputted into the drive time amount control section 12 through the image input section 19 from the outside. The current of the amount of currents amended by the current feed zone 14 and the brightness amendment section 13 is supplied to the drive time amount control section 12, drive time amount is controlled by pulse width based on image data for the supplied drive current, and it inputs into the chromaticity amendment section 11 as a pulse drive current. In addition, the drive time amount control section 12 may control the chromaticity amendment section 11 not by pulse width but by the count of a drive of a fixed pulse etc. in this case.
[0054] The chromaticity amendment section 11 amends further the pulse drive current inputted from the drive time amount control section 12. The chromaticity amendment section 11 amends the pulse drive current supplied to each LED based on chromaticity amendment data, in order to amend the chromaticity difference by chromaticity dispersion for every LED.
[0055] The address-generation section 18 generates the address which shows the line corresponding to the inputted synchronizing signal Hs, and inputs it into the common driver 17, the amendment data control section 31, and the drive time amount control section 12. The common driver 17 drives the line corresponding to the inputted address. Moreover, the chromaticity amendment section 11 serves as the segment driver, combines with the common driver 17, drives [the train corresponding to the drive time amount control section 12 is driven, and] one pixel to time sharing, and realizes a matrix display.
[0056] Next, brightness amendment and chromaticity amendment of a display 10 are explained. In the current feed zone 14, the drive current supplied to the brightness amendment section 13 from the current feed zone 14 is amended for every RGB based on the white balance amendment data and field brightness amendment data which were memorized by the amendment data storage section 32. Thus, the white balance and field brightness of the LED unit 1 whole are amended, and dispersion for every LED unit is prevented.
[0057] In the brightness amendment section 13, the drive current supplied to each LED is amended for every RGB which is a pixel based on the pixel brightness amendment data memorized by the amendment data storage section 32 for every RGB of each pixel. Thus, the brightness of each pixel is adjusted and dispersion in the brightness for every pixel in the same LED unit 1 is prevented.
[0058] In the chromaticity amendment section 11, the pulse drive current supplied to the amendment data storage section 32 from the drive time amount control section 12 based on the chromaticity amendment data memorized for every RGB of each pixel is amended for every RGB which is a pixel. Thus, the chromaticity of each pixel is amended, and while each color tone of RGB of each LED unit doubles with a reference value, dispersion in the chromaticity for every pixel in the LED unit 1 is also reduced sharply.
[0059] Therefore, it becomes possible to prevent dispersion not only in dispersion in the brightness for every

LED unit, and a chromaticity but the brightness for every pixel in the same LED unit and a chromaticity by this invention.

[0060] Moreover, after the drive current first supplied to each LED corresponding to the color tone of each RGB based on white balance amendment data and field brightness amendment data was amended in the current feed zone 14, the brightness amendment section 13 and the chromaticity amendment section 11 -- setting -- each of each pixel -- by amending a drive current according to an individual, amendment becomes possible for each [, such as white balance amendment, field brightness amendment, pixel brightness amendment, and pixel chromaticity amendment,] element of every.

[0061] Next, the chromaticity amendment section 11 is explained. In the chromaticity amendment section 11, a part of predetermined drive current supplied to LED of each color tone is distributed to the drive current of other color tones based on the chromaticity amendment data beforehand memorized to each pixel. That is, the drive current over B is distributed to LED of R and G which constitute the same pixel at LED of B and R from which the drive current over G constitutes the same pixel in LED of G and B from which the drive current over R constitutes the same pixel, respectively. A part of predetermined drive current which should be distributed, respectively is defined by setting up a partition ratio as for example, chromaticity amendment data. The partition ratio of the pulse drive current to LED of other color tones is set up beforehand, and chromaticity amendment data are memorized by the storage section for every color tone which is a pixel so that the chromaticity at the time of driving LED of one color tone of each pixel with a predetermined pulse drive current may be equivalent to the criteria chromaticity.

[0062] The partition ratio of G and B to R is set to rG and rB here, respectively, the partition ratio of B and R to G is set to gB and gR, respectively, and the partition ratio of R and G to B is set to bR and bG, respectively. Moreover, the amount of charges supplied to light emitting devices LR, LG, and LB based on image data DR, DG, and DB is set to QR, QG, and QB, respectively. Furthermore, it is the amount of charges applied according to the amount of luminescence of other light emitting devices, respectively Q'R When Q'G and Q'B, the total of amount Q"R of charges, Q"G, and Q"B which are supplied, respectively is expressed by the light emitting devices LR, LG, and LB of a certain pixel by the following formulas.

[0063]

[Equation 2]

$$\begin{bmatrix} Q''_R \\ Q''_G \\ Q''_B \end{bmatrix} = \begin{bmatrix} Q_R + Q'_R \\ Q_G + Q'_G \\ Q_B + Q'_B \end{bmatrix} - \begin{bmatrix} 1 & g_R & b_R \\ r_G & 1 & b_G \\ r_B & g_B & 1 \end{bmatrix} \begin{bmatrix} Q_R \\ Q_G \\ Q_B \end{bmatrix}$$

[0064] The amount of luminescence of a light emitting device is controllable by controlling the above-mentioned amount of charges. Here, the amounts of drive currents to the light emitting devices LR, LG, and LB of a certain pixel supplied from the current feed zone 14 are IR, IG, and IB, respectively, and when the drive time amount which performs a gradation expression based on each image data DR, DG, and DB is controlled as TR, TG, and TB, the amounts QR, QG, and QB of charges and Q'R, Q'G, and Q'B are expressed with the following formulas.

[0065]

[Equation 3] Qi=IiTi (i=R, G, B), Q'i=sigma (k!=i) ikIkTk (ik=rG, rB, gB, gR, bR, bG)

[0066] This situation is explained based on drawing 4 . For example, when the pulse drive current of RGB supplied from the drive time amount control section 12 based on each image data DR, DG, and DB of a certain pixel is expressed with (a), (b), and (c) in drawing 4 , respectively, It is amended in the chromaticity amendment section 11, and the last pulse drive current supplied to LED of each RGB of this pixel can be expressed with (d) of drawing 4 , (e), and (f). At this time, amount Q"R of charges, Q"G, and Q"B which are supplied to LED of each RGB of this pixel are expressed with the area surrounded as the continuous line. That is, in this example, luminescence of the light emitting device LB corresponding to the color tone of B will be performed also in the drive time amount TR and TG of the light emitting devices LR and LG of other color tones not only based on the drive time amount TB based on image data DB but the image data DR and DG. That is, amount Q"i of charges finally supplied serves as the amount of charges which added amount Q'i of charges equivalent to the part surrounded with the slash of drawing 4 to the original amount Qi of charges.

[0067] In the above example, amount Q'k (k!=i) of charges distributed showed the example added between the drive time amount Ti based on the image data Di of other color tones. However, you may make it this invention add amount Q'k of charges distributed to time amount shorter than the drive time amount Ti based on image data Di. It is because the amount of charges which should be distributed needs to control the amount kili of drive currents which should be distributed with high precision in order to perform amount Q'k of charges roughly distributed between the drive time amount Ti based on image data Di compared with the basic amount of

charges.

[0068] The schematic diagram of the chromaticity amendment section 11 is shown in drawing 5 . In the chromaticity amendment section 11, distribution block 111a of each RGB, b and c and synthetic block 112a, and b and c are allotted. Each distribution block 111a, and b and c have the chromaticity amendment data storage section which memorizes a partition ratio, and distribute the pulse drive current supplied from the drive time amount control section 12 corresponding to RGB to each synthetic block 112a, and b and c based on the memorized chromaticity amendment data. And in synthetic block 112a of each RGB, and b and c, the light emitting device which the pulse drive current distributed from each distribution block 111a, and b and c is compounded with an original pulse drive current, and each compounded pulse drive current should drive is supplied. Although it is also possible to make the partition ratio for all pixels memorize, and to constitute, as for this chromaticity amendment data storage section, it is desirable by rewriting the data of partition ratio storage memory dynamically for every pixel and every line as 1 pixel or memory space for one line to reduce memory space. In order to realize this configuration, the chromaticity amendment data storage section of the chromaticity amendment section 11 is made into the chromaticity amendment data temporary storage section, and it constitutes from a register, RAM, etc.

[0069] The example which similarly constituted the chromaticity amendment data storage section with the register of the capacity for one line with one shift register equivalent to the capacity for one line in drawing 6 is shown. Drawing 6 is illustrating only the part about R and this drawing is a schematic diagram showing R distribution block 111a and R composition block 112a. The chromaticity amendment data rG and rB to the line for a drive are held at the register in R distribution block 111a. A distribution circuit distributes the pulse drive current which should be distributed to LED of G and B based on the chromaticity amendment data rG and rB held at the register to synthetic block 112b of G and B, and c (not shown to drawing 6). In addition to the original pulse drive current supplied from the drive time amount control section 12, R composition block 112a compounds similarly the pulse drive current distributed to LED of R from distribution block 111b of G and B, and c, and supplies it to LED of R which is a pixel for a drive.

[0070] The chromaticity amendment data of the following line are inputted into a shift register while a sequential shift is carried out by the clock signal CLK through the chromaticity amendment data line DATA for every rG and rB. And according to the switch timing to the following line, by the latch signal LATCH, chromaticity amendment data are transmitted to a register and the chromaticity amendment data of the following line for a drive are held at a register. Thus, circuitry can be simplified by inputting carrying out the sequential shift of the chromaticity amendment data with a shift register. Although the example as which chromaticity amendment data are inputted into juxtaposition for every rG and rB was shown here, the shift register corresponding to the chromaticity amendment data rG and rB may be connected and constituted in a serial.

[0071] [An example 2], next the example 2 which are other examples of this invention are explained.

[0072] The pulse drive current of 1 image frame time supplied to drawing 7 at the light emitting devices LR, LG, and LB in an example 2, respectively is shown. In this specification, an image frame points out the section which displays the image data for one screen, and between the pulses of VSYNC (Vertical Synchronizing signal) which serves as a frame signal in the chart shown in the maximum upper case of drawing 7 hits 1 image frame time. Here, the image frame time corresponding to 1 image frame of the video signal corresponding to one color tone is divided, and the driving pulse by which pulse width control was carried out corresponding to image data is assigned to each. The amount of luminescence is controlled by making a part of the divided image frame time into predetermined time amount, and supplying a part to the pulse drive current over the light emitting device of other color tones. Here, the drive time amount TR, TG, and TB based on each image data DR, DG, and DB of the image frame to which the width of face of each field surrounded by the line corresponds shall be set up for simplification of drawing. Moreover, the reference clock which is a RF is used so that the drive time amount control section 12 can perform a gradation expression in the divided image frame time.

[0073] As an example, the pulse drive current of the light emitting device LR corresponding to R is explained. A part of image frame time into which 1 image frame was divided is changed for the pulse drive current supplied, respectively to light emitting devices LG and LB, and it is supplied to them. In drawing 7 , the pulse of the tail of image frame time is replaced mutually, respectively. By this, amount A'R of luminescence according to the amounts AG and AB of luminescence to the light emitting devices LG and LB of other color tones can be added to the amount AR of luminescence of the light emitting device corresponding to R in the drive time amount of 1 image frame. At this time, the amount of luminescence according to color tone dispersion for every light emitting device can be applied controlling the count of the pulse drive current to replace, or by controlling the amount of drive currents.

[0074] Also in an example 2, like an example 1, the data about the count or the amount of drive currents of the

pulse drive current which is chromaticity amendment data and to replace are memorized, and a distribution circuit generates the pulse drive current according to chromaticity amendment data in the chromaticity amendment data storage section of each distribution block 111a, and b and c, and supplies it suitably at each synthetic block 112a, and b and c.

[0075] [Example 3] The example 3 which is an example of further others is explained.

[0076] The example of the pulse drive current supplied to the light emitting devices LR, LG, and LB in an example 3 at drawing 8 , respectively is shown. Here, the drive time amount corresponding to 1 image frame of the video signal corresponding to one color tone is divided into three. By making one of the divided time amount of the into the main display period, the pulse drive current of the color tone corresponding to a light emitting device is supplied, two drive time amount which others divided is made into a color correction period, and amount A"k of luminescence added by supplying the pulse drive current of other color tones is controlled. Here, the drive time amount TR, TG, and TB based on each image data DR, DG, and DB of the image frame to which each field surrounded by the line corresponds shall be set up. In this example, drive time amount is shortened by fully taking drive time amount and setting up reference clock width of face small about the pulse drive current of other color tones by setting reference clock width of face as light emitting devices LR, LG, and LB greatly about the pulse drive current based on the image data DR, DG, and DB corresponding to each. Thus, the amount of luminescence according to the amount of luminescence to the light emitting device of one color tone can be applied to the amount of luminescence of the light emitting device of other color tones in the drive time amount of 1 image frame. At this time, the ratio of reference clock width of face, i.e., the frequency of a reference clock, is controlled, or the amount of luminescence according to dispersion for every light emitting device can be applied by controlling the amount of drive currents.

[0077] In an example 3, the drive time amount control section 12 has the chromaticity amendment data storage section, and controls each drive time amount based on the data about the frequency ratio of the reference clock which is chromaticity amendment data. And in the chromaticity amendment section 11, each pulse drive current is changed to the light emitting device which should be supplied according to the exchange timing of a pulse drive current.

[0078] the above-mentioned examples 1-3 -- RGB -- although it explained that chromaticity amendment was performed also about which light emitting device, the chromaticity amendment section should just distribute a part of predetermined drive current supplied to the light emitting device corresponding to any one color tone at least among two or more color tones if needed to the light emitting device corresponding to other one or more color tones.

[0079] As mentioned above, the amendment data storage section 32 was constituted in the LED unit, and the chromaticity amendment section 11 showed the example controlled directly based on the chromaticity amendment data memorized by said amendment data storage section 32. However, as for the image display control approach of the invention in this application, it is possible to also make the brightness and color tone dispersion information on a light emitting device corresponding to an indicative data reflect by forming an indicative data into many bits using the approach of picture signal processing. However, signal processing becomes complicated in this case, and gradation control of high resolution and coexistence of highly precise brightness amendment or chromaticity amendment are difficult. Furthermore, in the case of the large-sized display constituted by the small unit by dividing like a LED display, since amendment data are put on the signal-processing part which carries out package control of the indicative data, the dispersion data of a light emitting device and a light emitting device will exist separately, and management of data becomes difficult at it at the time of maintenance check like [when exchanging some units]. Therefore, as the image display control approach of an LED unit, the approach of controlling directly is desirable.

[0080] The [chromaticity amendment approach which is image display device] The control approach of the image display device of this invention is explained as an example 4 below. Drawing 9 is the conceptual diagram of the chromaticity amendment system used for the control approach of the image display device of this invention. The system shown in this drawing consists of brightness and chromoscope 42 which is connected to the LED unit 1, the brightness and chromaticity compensator 41 which are connected to the LED unit 1, and brightness and a chromaticity compensator 41, and detects the luminescence reinforcement of the LED unit 1.

[0081] A chromaticity amendment system carries out lighting control of each dot of the LED unit 1 with brightness and the chromaticity compensator 41. It is arranged and the luminescence detector on the strength which has a photo detector corresponding to two or more color tones is connected so that luminescence from the LED unit 1 may be received by the light sensing portion of a luminescence detector on the strength as brightness and chromoscope 42. With brightness and chromoscope 42, brightness and the chromaticity compensator 41 read the data of the chromaticity of LED unit 1 each pixel, and brightness, and computes each average of the LED unit 1 whole. And the drive current supplied from the current feed zone 14 is amended for

every RGB so that it may be in agreement with the reference value of the white balance to which each of the average value was set beforehand, and field brightness. The correction value for every RGB of each pixel is calculated by matrix operation from the reference value of brightness and a chromaticity. Moreover, coincidence is asked also for dot correction value and chromaticity correction value. The amendment data about this control are memorized by the amendment data storage section 32 as white balance amendment data and field brightness amendment data through the communications department 33 in the LED unit 1 shown in drawing 3 .

[0082] Next, brightness and the chromaticity compensator 41 read the brightness data of each dot of the LED unit 1 driven according to the drive current conditions amended with said set point. And the brightness amendment section 13 of drawing 3 controls a drive current for every dot in agreement with the reference value with which the brightness in each dot was set up beforehand. The pixel brightness amendment data about this control are memorized by the amendment data storage section 32 as pixel brightness amendment data through the communications department 33 in the LED unit 1.

[0083] Furthermore, it is made to drive, without distributing LED corresponding to each color tone RGB in the chromaticity amendment section 11 according to the pulse drive current amended for every RGB of each pixel by each pixel of the LED unit 1. And each chromaticity is computed for every pixel from the light-receiving reinforcement of the photo detector corresponding to two or more color tones. Furthermore, the chromaticity and criteria chromaticity which were computed for every pixel by the light emitting device of each color tone are measured. The chromaticity of each pixel is amended by the light emitting device of each color tone by controlling the pulse drive current which brightness and the chromaticity compensator 41 distribute in the chromaticity amendment section 11 of the LED unit 1 based on the chromaticity difference of the chromaticity and criteria chromaticity which were computed for every pixel. Brightness and the chromaticity compensator 41 make the amendment data storage section 32 memorize the chromaticity amendment data about the drive current distributed to LED of other color tones as chromaticity amendment data for every pixel through the communications department 33 in the LED unit 1 for every pixel from the drive current supplied to LED of each color tone. In addition, it is better than the reference value of brightness and a chromaticity also as a configuration which asks coincidence for brightness correction value and chromaticity correction value by calculating the correction value for every RGB of each pixel by matrix operation.

[0084] The above-mentioned amendment approach is an example for explaining this system, it is repeating this process two or more times, and it cannot be overemphasized that the convergence value of amendment can be made highly precise more. Moreover, effective effectiveness is acquired, even if it starts an amendment process from chromaticity amendment and pixel brightness amendment, field brightness amendment, white balance adjustment, and a procedure contrary to the above adjust it. Moreover, although various amendment data were explained by the approach of memorizing separately in this invention like chromaticity amendment data, pixel amendment data, field brightness amendment data, and white balance amendment data, it is also possible to carry out batch processing for every pixel, and to memorize as amendment data for every pixel.

[0085] [Example 5] The image display device of the example 5 of this invention is explained further again. In this example, while supplying and carrying out brightness control of the main currents to LED which constitutes the pixel of arbitration, it carries out by adding the amendment current for chromaticity amendment to LED which constitutes other pixels, and combining chromaticity amendment.

[0086] That is, in order that the light emitting device of three colors may amend the color tone of the light emitting device of each color, i.e., dispersion of a chromaticity, in the configuration connected to the drive circuit, in this invention, to the light emitting device of the color for chromaticity amendment, very small lighting of the light emitting device of other two colors is carried out, and chromaticity amendment is performed. For example, when carrying out chromaticity amendment of the red, chromaticity amendment of a red light emitting device is performed by adding an amendment current to a green and/or blue light emitting device. Similarly, red and blue amendment current addition are performed about green chromaticity amendment, and red and green amendment current addition are performed by time sharing about blue chromaticity amendment, respectively.

[0087] Drawing 10 is the block diagram showing notionally the configuration of the LED display unit concerning the image display device of an example 5. The image display device of drawing 10 is equipped with the display 10 which arranged two or more LED in the shape of a matrix to every pixel L, the mechanical component 50 which drives LED of a display 10, and the drive control section 51 which transmits various control data to a mechanical component 50. A mechanical component 50 is set to vertical-drive section 50A from level mechanical-component 50B. Vertical-drive section 50A is the common driver 17, and level mechanical-component 50B is LED driver 50b.

[0088] In the image display device of drawing 10 , image data, brightness amendment data, chromaticity amendment data, etc. are transmitted to a mechanical component 50 from the drive control section 51. In this

image display device, the dynamic drive is performed directly. The drive control section 51 controls the common driver 17 which is vertical-drive section 50A, and is performing the current supply change to LED connected to each common line on the LED dot matrix whose common driver 17 is a display 10.
[0089] Two or more steps are connected and LED driver 50b which is level mechanical-component 50B supplies a current to LED connected to the line chosen by the common driver 17.
[0090] An example of the circuitry of the image display device of an example 5 is shown in drawing 11 . The level mechanical component shown in drawing as LED which is a light emitting device LR, LG, and LB, It connects with such LED respectively. The 1st three current mechanical component 52 in which the drive control according to individual is possible, It has the three lighting pulse generating sections 63R, 63G, and 63B which are connected to the 2nd current mechanical component 53 which supplies an amendment current to each LED, the 1st current mechanical component 52, and the 2nd current mechanical component 53, and input a lighting pulse. The lighting pulse generating section 63 of each LED is connected to the 2nd current mechanical component 53 through the selector 54. A selector 54 is a selector which chooses the input from each point LGT pulse generating section 63, and is outputted to the 2nd current mechanical component 53, and can control the amendment current of each LED by the 2nd current mechanical component 53 of 1 to time sharing. The 1st current mechanical component 52 supplies an amendment current based on the lighting pulse as which the 2nd current mechanical component 53 was chosen by the selector 54 while carrying out brightness amendment of each LED based on the lighting pulse, and, as for the circuit of this configuration, chromaticity amendment of each LED is performed.
[0091] [Example 6] The example of a configuration is shown for the image display device of the example 6 of this invention in drawing 12 further again. It connects with a light emitting device, respectively, and the 1st current mechanical component 52 shown in this drawing supplies main currents based on image data. For said every light emitting device Two or more 1st constant current mechanical components 60 in which the drive control according to individual is possible, It has the main current switch 62 which is connected to a serial between the 1st current adjustment section 61 which is connected to the 1st constant current mechanical component 60, and adjusts the output current of the 1st constant current mechanical component 60, the 1st constant current mechanical component 60, and a light emitting device, and controls the current supply source to a light emitting device.
[0092] The 1st constant current mechanical component 60 shown in drawing 12 is connected with each LED through the main current switches 62R, 62G, and 62B, respectively. ON/OFF control of each main current switch 62 is performed by the lighting pulse generation sections 63R, 63G, and 63B connected with each main current switch 62, respectively. The lighting pulse generation section 63 generates a lighting pulse by Pulse Density Modulation (Palse Width Moduration) based on the indicative data which received from the drive control section 51. The lighting pulse generation section 63 adds this lighting pulse as an ON/OFF control signal of each main current switch 62, and performs drive control of the main currents in each 1st constant current mechanical component 60.
[0093] In addition, although the main current switch 62 shown in drawing 12 is connected to the serial between the 1st constant current mechanical component 60 and a light emitting device, the location of the main current switch 62 is not restricted to this. For example, the main current switch 62 can also be formed between the 1st constant current mechanical component 60 and the 1st current adjustment section 61. Moreover, the PWM control based on the lighting pulse from the lighting pulse generation section 63 is not restricted to the configuration performed with the main current switch 62, either, but can also be performed in the 1st constant current mechanical component 60 or the 1st current adjustment section 61.
[0094] Moreover, in order to perform chromaticity amendment of each LED further, it has the drive circuit of drawing 12 with the 2nd constant current mechanical component 64 and the 2nd current adjustment section 65 connected to the 2nd constant current mechanical component 64. By this configuration, performing a constant current drive by the 1st constant current mechanical component 60 about the main currents which control the brightness of each LED, an amendment current is added to LED other than the chromaticity from which the 2nd constant current mechanical component 64 serves as a candidate for amendment to the LED concerned further, and chromaticity amendment is performed. The 2nd current adjustment section 65 separately prepared for the 2nd constant current mechanical component 64 adjusts the value of the amendment current to add.
[0095] The 1st current adjustment section 61 and the 2nd current adjustment section 65 consist of DA converters for current adjustment. that is, — the example of drawing 12 — per pixel — the D/A converter (DAC) for brightness amendment of one circuit, and the D/A converter for chromaticity amendment — providing — **** — each color — individual control is enabled.
[0096] The 2nd current mechanical component 53 can be formed according to an individual per RGB each color, and can also be considered as the configuration which can perform chromaticity amendment of each color to

coincidence, and can make the 2nd current mechanical component 53 common to RGB, and can also perform chromaticity amendment of each color by time sharing. In the example of drawing 12 , the 2nd one current adjustment section 65 is connected to juxtaposition to the 2nd three constant current mechanical component 64. The number of the 2nd current adjustment sections 65 required for supply of an amendment current can be reduced by this. however, every — it is possible to prepare two or more current regulator circuits required for supply of an amendment current, such as to consider as the configuration which prepares the 2nd current adjustment section in the 2nd constant current mechanical component, respectively, and to also make two or more chromaticity amendment currents supply to coincidence.

[0097] The 2nd current adjustment section 65 determines an output current value, and the 2nd constant current mechanical component performs chromaticity amendment by adding this to the main currents of each color as an amendment current for chromaticity amendment. The 2nd current adjustment section 65 adjusts about the current value added by the 2nd constant current mechanical component 64. For example, when amending R (red), the 2nd constant current mechanical component 64 for G (green) and B (blue) is also driven, respectively by the lighting pulse signal which the lighting pulse generation section 63 for red generates. And while supplying main currents to red LED, red chromaticity amendment is performed by passing an amendment current to green and blue LED, and making these turn on. The same means also performs chromaticity amendment of other colors. For example, red and a blue amendment current are added to green chromaticity amendment, and red and a green amendment current are added to blue chromaticity amendment.

[0098] Consequently, when making RGB turn on as 1 pixel, the amendment current of other two colors will be added to LED of each color to main currents, respectively. For example, in red LED, the main currents for red lighting, the amendment current for green amendment, and the amendment current for blue amendment flow. Main currents and the amendment current for chromaticity amendment are compounded by each 2nd current mechanical component.

[0099] The image display device of the above example 6 has the following configurations.

(1) It has the 1st current adjustment section 61 which controls the main currents of each color according to an individual. Based on the gradation data received from the drive control section 51, the gradation pulse width of the lighting pulse generation section 63 is determined, and main currents are supplied to LED from the 1st constant current mechanical component 60 during this pulse shelf-life.

(2) The image display device of an example 6 is further inputted into the 2nd constant current mechanical component 64 of other two colors by making into a drive control signal the lighting pulse generated in the lighting pulse generation section 63 about LED for chromaticity amendment. And the amendment current for predetermined chromaticity amendment is made to add to the main currents of LED which hits an amendment color based on the 2nd current adjustment section 65.

[0100] According to such a description, in the image display device of an example 6 While adjusting the main currents outputted by the 1st constant current mechanical component 60 and the 1st current adjustment section 61 in the mechanical components 50 of red, green, and blue LED It becomes possible to perform chromaticity amendment of each color LED and to make dispersion in an individual into homogeneity by carrying out drive control of the amendment current added to main currents, by the 2nd constant current mechanical component 64 and the 2nd current adjustment section 65.

[0101] The image display device concerning [an example 7], next the example 7 of this invention is shown in drawing 13 . LR, LG, and LB whose constant current drive circuit of drawing 13 is LED of RGB, The output sections OUTR, OUTG, and OUTB and the lighting pulse generation sections 63R, 63G, and 63B which were connected to each LED, It has 1st current adjustment DA converter 61AR which is the 1st current adjustment section 61, 61AG, 61AB, 2nd current adjustment DA converter 65A that is the 2nd current adjustment section 65, and the amendment current switches 1-SW 6 and the switch control section 66 which constitute the 2nd constant current mechanical component 64. The concrete configuration of the image display device concerning an example 7 is explained referring to the constant current drive circuit for the chromaticity amendment shown in drawing 13 hereafter.

[0102] the output section of LED by which the constant current drive circuit shown in drawing 13 controls 1 pixel — each RGB — it constitutes from the three output sections, OUTR, OUTG, and OUTB. The constant current drive of each output section presupposes that it is controllable according to an individual. At this example, adjustment of the brightness of each LED is performed by the gradation control by Pulse Density Modulation. Specifically a gradation reference clock (GCLK) is inputted into the lighting pulse generation sections 63R, 63G, and 63B, Pulse Density Modulation is performed based on gradation data (DATAs 1-3), and the lighting section is controlled. By this lighting pulse signal, the main currents passed in each output section are determined by 1st current adjustment DA converter 61AR, 61AG, and 61AB, and each output sections OUTR, OUTG, and OUTB are driven. Control data DAC_Data 1-4 is inputted and ******(ed) by 1st current

adjustment DA converter 61AR, 61AG, 61AB, and the 2nd current adjustment DA converter65A, respectively. As control data DAC_Data 1-3, there are white balance amendment data, field brightness amendment data, pixel brightness amendment data, etc. here, and control data DAC_Data4 is chromaticity amendment data.
[0103] In this example, in order to carry out chromaticity amendment of the LED of the color of arbitration, in the same lighting section, an amendment current is added to other two colors, and it adjusts so that LED may serve as a predetermined chromaticity. That is, since it is necessary to add an amendment current to other two colors in order to amend one color, by three colors, addition of a total of six kinds of amendment currents is needed. The constant current drive circuit shown in drawing 13 is equipped with the amendment current switches 1-SW 6, and each amendment current switch SW is turned on by time sharing according to a chromaticity amendment selection signal.
[0104] An example of the timing diagram for chromaticity amendment actuation is shown in drawing 14 . 1 image frame which makes a frame signal VSYNC (Vertical Synchronizing signal) which shows the head of an image frame is divided into six, and this actuation uses it as an image transfer frame (Frame), transmits image data with the image transfer frames 1-6, and performs image display actuation. A flicker can be prevented by dividing 1 image frame into two or more image transfer frames, and performing the lighting display based on the same image data two or more times in each image transfer frame.
[0105] Chromaticity amendment actuation of each color is carried out for each [which was divided into six] image transfer frame of every. Each chromaticity amendment current value used as the candidate for chromaticity amendment is transmitted as chromaticity amendment current data with a front image transfer frame. That is, in the front image transfer frame, each chromaticity amendment current data is transmitted to 2nd current adjustment DA converter 65A, LED for chromaticity amendment is made to turn on the amendment current switch SW with an image [degree] transfer frame, and an amendment current is added. The amendment current switch SW performs addition control of an amendment current by time sharing according to a chromaticity amendment selection signal. An amendment current is added to LED other than LED for chromaticity amendment through the amendment current switch SW from the 2nd current adjustment DA converter65A. As mentioned above, the process which transmits the chromaticity amendment current data of a front image transfer frame, the process to which 2nd current-adjustment DA converter 65A supplies a chromaticity amendment current based on the chromaticity amendment current data transmitted with the front image transfer frame, and the process which turn ON the amendment current switch SW with which the switch control section 66 corresponds based on a chromaticity amendment selection signal are included in each image transfer frame which drawing 14 shows.
[0106] For example, R_g chromaticity amendment data show the chromaticity amendment current data for making G (green) emit light, in order to carry out chromaticity amendment of the LED of R (red). R_g chromaticity amendment data are transmitted with the image transfer frame 6, data are held with the following image transfer frame 1, and a chromaticity amendment current is reflected. PWM control is carried out by the lighting pulse generation section 63, while the amendment current switch SW3 is chosen by the chromaticity amendment selection signal with the image [degree] transfer frame 1, being in ON condition and supplying an amendment current from current adjustment DA converter65A based on R_g chromaticity amendment current data. Thus, the chromaticity amendment current of G is added during the period which LED of R has turned on. Similarly, it processes in order to the image transfer frames 1-6, the amendment current switches 1-SW 6 are changed to time sharing, and chromaticity amendment of LED of all colors is performed at the image frame period of 1.
[0107] Although here showed the example which supplies the amendment current for LED chromaticity amendment in each image transfer frame, it can be set up suitably whether an amendment current is supplied in the number of image transfer frames and which image transfer frame. It is determined from a viewpoint of flicker prevention of an image display device whether to divide a 1 image frame into how many, and to set up the number of image transfer frames, and supply of an amendment current is based on the number of color tones of LED made to turn on for the number of color tones of LED to be used, or amendment. For example, the number of image transfer frames is set to 8, and you may make it supply an amendment current in six of image transfer frames [them].
[0108]
[Effect of the Invention] The image display device and its control approach of this invention cannot be concerned with chromaticity dispersion of light emitting devices, such as LED, but can make the chromaticity for every pixel homogeneity as explained above.
[0109] When the amendment data storage section is constituted in an image display unit and the chromaticity amendment section considers as the configuration controlled directly based on the chromaticity amendment data memorized by the amendment data storage section especially, it becomes possible to manufacture the unit

of the same brightness and a color tone, and the image display which was excellent in homogeneity not only every unit but in the same unit can be offered.

[0110] Moreover, since it is easy to IC-ize the chromaticity amendment section with the current feed zone in a mechanical component, the brightness amendment section, a drive time amount control section, etc., the formation of a small thin shape and low-cost-izing of an image display device are realizable for coincidence. Furthermore, when it constitutes a large-sized display from two or more image display units again, and each image display unit has an amendment function, the effectiveness that maintainability, such as exchange of an image display unit unit, is improved sharply is acquired. Since it becomes unnecessary to take into consideration dispersion in a light emitting device further again by the image data control circuit side of the exterior which supplies image data to an image display device, an external device can be concentrated now on the function which displays an image on a uniform screen, and signal processing which makes higher-definition image display possible becomes realizable.

[0111] As mentioned above, while cheap LED with dispersion in a property is used for the image display device and its control approach of this invention and reducing a manufacturing cost, the features that the quality image display device which was excellent in repeatability to the same data can be offered are realized.

[0112] Furthermore, in the image display device concerning this invention, the current adjustment section can be provided in 1 pixel per ** for chromaticity amendment, and changing and adding the amendment current for chromaticity amendment of each color by ON/OFF control of an amendment current switch can perform chromaticity amendment of a total color with the image frame period of one image. Chromaticity amendment of a total color can be realized by this configuration, without using many current adjustment DA converter circuits etc. It was the part which needs a tooth space especially since a current adjustment DA converter constitutes a circuit combining resistance etc. Without forming the 2nd current adjustment DA converter according to an individual for every light emitting device, while this invention which can control a chromaticity amendment current for a 1-pixel light emitting device by the circuit of 1 can reduce components mark and can make them cheap circuitry, the features which cut down the size of a circuit and contribute also to the miniaturization of equipment are realized.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the image display device which equipped the detail with the function which amends the amount of luminescence according to property dispersion of a light emitting device, and its control approach about the image display device with which the light emitting device of two or more color tones has been arranged for every pixel, and its control approach.

[Translation done.]

PRIOR ART

[Description of the Prior Art] The red (Red) whose light emitting devices of high brightness, such as light emitting diode (referred to also as "LED" Light Emitting Diode and the following.), are the three primary colors of light, and since it was developed per each RGB of green (Green) and blue (Blue), a large-sized spontaneous light type full color display came to be produced today. Since it has the descriptions, like a light weight and thin-shape-izing are possible for a LED display inside, and power consumption is low, also outdoors, need is increasing rapidly as an usable large-sized display.

[0003] In the case of a large-sized LED display which is installed in the outdoors, it is constituted by generally combining two or more LED units, and each part of full-screen data is displayed on each LED unit. The light emitting diode which makes RGB a lot on a substrate is arranged in the shape of a pixel matrix, and each LED unit performs the same actuation as an above-mentioned LED display to an LED unit. In a large-sized LED display with big size, LED of about 300,000 pixels of sum totals beside [640] vertical 300x is used, for example. Moreover, this 1 pixel is constituted from the combination of LED of 3 or more dots which emits light to R, G, and B by the full color LED display, respectively.

[0004] Generally as a drive method of an LED unit, the dynamic drive method is used. For example, in the case of the LED display constituted in the shape of [of a m line xn train] a matrix, the anode terminal of LED located in each line is connected common to one common source line, and the cathode terminal of LED located in each train is connected common to one current Rhine. Sequential ON of the common source line whose m lines are is carried out with a predetermined period, and a drive current is supplied to n ****** current Rhine according to the image data corresponding to turned-on Rhine. The drive current according to the image data is impressed to LED of each pixel by this, and an image is displayed.

[0005] In order to reproduce image data on a LED display correctly, it is needed that the optical output properties (drive current-brightness property etc.) of each LED are uniform. However, the LED component actually manufactured does not have homogeneous all. Although an LED component is formed on a wafer of a semi-conductor manufacturing technology, dispersion in an optical output property or an emission spectrum arises with a manufacture lot, a wafer, or a chip. For this reason, according to dispersion in the LED property of each pixel, for example, dispersion of brightness or a chromaticity, it is necessary to amend the magnitude of the drive current corresponding to each image data.

[0006] As an amendment means of image data, the method of performing for example, brightness amendment is developed (approach indicated by the patent official report No. 2950178). For example, by making the drive current of the amount according to dispersion in the optical output property of each LED fluctuate, even if it is which LED, there is the approach of amending so that the same optical output may be obtained to the image data input of the same value.

[0007] Or a quality image is displayed using the image data which carried out brightness amendment for every LED component. The amendment data storage section is made to specifically memorize the brightness amendment data corresponding to each LED component in the control circuit which controls lighting of a LED display, respectively. As this amendment data storage section, ROM is used, for example. A control circuit amends and displays image data based on the amendment data stored in ROM.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] The image display device and its control approach of this invention cannot be concerned with chromaticity dispersion of light emitting devices, such as LED, but can make the chromaticity for every pixel homogeneity as explained above.
[0109] When the amendment data storage section is constituted in an image display unit and the chromaticity amendment section considers as the configuration controlled directly based on the chromaticity amendment data memorized by the amendment data storage section especially, it becomes possible to manufacture the unit of the same brightness and a color tone, and the image display which was excellent in homogeneity not only every unit but in the same unit can be offered.
[0110] Moreover, since it is easy to IC-ize the chromaticity amendment section with the current feed zone in a mechanical component, the brightness amendment section, a drive time amount control section, etc., the formation of a small thin shape and low-cost-izing of an image display device are realizable for coincidence. Furthermore, when it constitutes a large-sized display from two or more image display units again, and each image display unit has an amendment function, the effectiveness that maintainability, such as exchange of an image display unit unit, is improved sharply is acquired. Since it becomes unnecessary to take into consideration dispersion in a light emitting device further again by the image data control circuit side of the exterior which supplies image data to an image display device, an external device can be concentrated now on the function which displays an image on a uniform screen, and signal processing which makes higher-definition image display possible becomes realizable.
[0111] As mentioned above, while cheap LED with dispersion in a property is used for the image display device and its control approach of this invention and reducing a manufacturing cost, the features that the quality image display device which was excellent in repeatability to the same data can be offered are realized.
[0112] Furthermore, in the image display device concerning this invention, the current adjustment section can be provided in 1 pixel per ** for chromaticity amendment, and changing and adding the amendment current for chromaticity amendment of each color by ON/OFF control of an amendment current switch can perform chromaticity amendment of a total color with the image frame period of one image. Chromaticity amendment of a total color can be realized by this configuration, without using many current adjustment DA converter circuits etc. It was the part which needs a tooth space especially since a current adjustment DA converter constitutes a circuit combining resistance etc. Without forming the 2nd current adjustment DA converter according to an individual for every light emitting device, while this invention which can control a chromaticity amendment current for a 1-pixel light emitting device by the circuit of 1 can reduce components mark and can make them cheap circuitry, the features which cut down the size of a circuit and contribute also to the miniaturization of equipment are realized.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, by the above-mentioned approach, all, even if it can amend brightness, it cannot amend a chromaticity. As for an LED component, not only brightness but dispersion of a chromaticity exists for every component. For this reason, even if it performed only brightness amendment and equalized the brightness between pixels, the chromaticity for every pixel could not be amended, but since a color tone varied, it became the sensibility with which the display image was rough, and there was a problem that the quality of a display image deteriorated. Dispersion in a chromaticity becomes remarkable, so that there is much color number used especially. In order to express the image of high quality as the full color display using RGB, not only brightness amendment but chromaticity amendment becomes important.
[0009] This invention is made in view of such a trouble. Even if the important purpose of this invention is an image display device which uses the light emitting device as which dispersion in a property is regarded, it is to offer the image display device in which image display is possible and its control approach of high quality with the sufficient repeatability equalized by performing chromaticity amendment of the light emitting device of each color.

[Translation done.]

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MEANS

[Means for Solving the Problem] In order to attain the above purpose, the image display device indicated by claim 1 of this invention The 1st current adjustment section 61R, 61G, and 61B for adjusting the drive current by which comes to arrange the light emitting device of two or more color tones for every pixel, and it is supplied to said each of light emitting device of two or more color tones for every pixel based on the image data about two or more color tones, In order to amend the color tone of said light emitting device corresponding to any one color tone at least among two or more color tones of each pixel, it has the 2nd current adjustment section 65 for adjusting the amendment current supplied to the light emitting device corresponding to other one or more color tones of this pixel. This image display device 1 image frame which makes VSYNC a frame signal In case it divides into plurality, it considers as an image transfer frame and image display actuation is performed based on the same image data with each image transfer frame, it sets on the image transfer frame of at least 1. While supplying the amendment current for amending the color tone of the light emitting device of any one color tone to the light emitting device of any other one color tone In order to amend the color tone of any one light emitting device for every image transfer frame, it is characterized by constituting and becoming so that color tone amendment to the light emitting device of two or more color tones by changing the amendment current supplied to any other one light emitting device may be realized by time sharing.
[0011] Thus, by constituting, it cannot be concerned with chromaticity dispersion of a light emitting device, but the image display device which can make the chromaticity for every pixel homogeneity can be offered.
[0012] Moreover, by this configuration, a chromaticity can be amended by making the light emitting device corresponding to other one or more color tones emit light, and a flicker of a display can be prevented so that the luminescent chromaticity of that color tone may be amended at least among two or more color tones during luminescence of said light emitting device corresponding to any one color tone.
[0013] Moreover, in addition to the description the image display device indicated by claim 2 of this invention is indicated to be by said claim 1, the color tone of said light emitting device is characterized by to be red and being green and blue.
[0014] Furthermore, the image display device indicated by claim 3 of this invention is characterized by performing brightness amendment of each light emitting device.
[0015] Moreover, in the image display device indicated by claim 4 of this invention, the 1st current adjustment section 61 of 1 supplies a drive current to the light emitting device of the color tone of 1, and said 1st current adjustment section 61 is characterized by said 2nd current adjustment section 65 supplying an amendment current to the light emitting device of the color tone of plurality [section / 65 / of 1 / 2nd / current adjustment].
[0016] Next, the image display device indicated by claim 5 of this invention is characterized by enabling a setup of whether have set on the number of the image transfer frames which divided the image frame, and which image transfer frame, and an amendment current is supplied to the light emitting device of the color tone of a gap.
[0017] Furthermore, in the image display device indicated by claim 6 of this invention, said 1st current adjustment section 61 is 1st current adjustment DA converter 61AR, 61AG, and 61AB, and it is characterized by said 2nd current adjustment section 65 being the 2nd current adjustment DA converter65A.
[0018] Furthermore, the image display device indicated by claim 7 of this invention The lighting pulse generation sections 63R, 63G, and 63B of at least 1 which generates the lighting pulse which controls luminescence of said light emitting device, respectively, Two or more main current switches 62R, 62G, and 62B with which ON/OFF is controlled by said lighting pulse generation sections 63R, 63G, and 63B, respectively, It has the switch control sections 66, 66, and 66 which carry out ON/OFF control of two or more amendment current switches 1-SW 6 and said amendment current switches SW 1-6 for adjusting an amendment current. This image display device said 1st current adjustment section 61R, 61G, and 61B The drive current supplied to each light emitting device

through said main current switches 62R, 62G, and 62B is adjusted. Said 2nd current adjustment section 65 It is characterized by adjusting the amendment current supplied to each light emitting device through said amendment current switches 1-SW 6, adding an amendment current to a drive current, and performing color tone amendment for every light emitting device.

[0019] Moreover, in the image display device indicated by claim 8 of this invention, said lighting pulse generation sections 63R, 63G, and 63B are characterized by carrying out Pulse Density Modulation of the gradation data, and controlling the lighting section based on a gradation reference clock.

[0020] Moreover, in the image display device indicated by claim 9 of this invention, said switch control sections 66, 66, and 66 are characterized by performing ON/OFF control of said amendment current switches 1-SW 6 with a chromaticity amendment selection signal.

[0021] Furthermore, when it comes to arrange the light emitting devices LR, LG, and LB corresponding to two or more color tones RGB for every pixel and they control each amount AR, AG, and AB of luminescence of said light emitting devices LR, LG, and LB for every pixel based on the image data DR, DG, and DB about RGB, multicolor luminescence of the image display control approach indicated by claim 10 of this invention is carried out. This image display control approach 1 image frame which makes VSYNC a frame signal In case it divides into plurality, it considers as an image transfer frame and image display actuation is performed based on the same image data with each image transfer frame, it sets on the image transfer frame of at least 1. The light emitting device Li (i=R) concerning any one color tone at least among RGB of each pixel In case G and B emit light based on image data Di, while making the light emitting device Lk (k!=i) of other one or more color tones of this pixel emit light in the amount Ak of luminescence according to image data Dk A light emitting device Lk is made to emit light by amount A'k of luminescence further according to the amount Ai of luminescence of said light emitting device Li. The amount of luminescence of a light emitting device Lk is made into Ak+A'k. Further addition of amount A'k of luminescence for amendment In order to amend any one color tone within the image transfer frame of 1, while making the light emitting device of others and any one color tone emit light by amount A'k of luminescence By changing amount A'k of luminescence which makes any other one light emitting device emit light, in order to amend the color tone of any one light emitting device for every image transfer frame, it constitutes and becomes so that color tone amendment to the light emitting device of two or more color tones may be realized by time sharing.

[0022] The control approach of the image display device indicated by claim 11 of this invention further again The 1st current adjustment section 61R, 61G, and 61B for adjusting the drive current by which comes to arrange the light emitting device of two or more color tones for every pixel, and it is supplied to said each of light emitting device of two or more color tones for every pixel based on the image data about two or more color tones, In order to amend the color tone of said light emitting device corresponding to any one color tone at least among two or more color tones of each pixel The brightness and color tone of an image display device equipped with the 2nd current adjustment section 65 for adjusting the amendment current supplied to the light emitting device corresponding to other one or more color tones of this pixel are amended. The control approach of this image display device with the luminescence detector on the strength which has a photo detector corresponding to two or more color tones The brightness and color tone calculation process which computes the brightness and color tone of a light emitting device corresponding to each color tone of said display for every pixel, The brightness and color tone difference calculation process which compares with criteria brightness and a criteria color tone the brightness of the light emitting device corresponding to each color tone computed for every pixel in said brightness and color tone calculation process, and a color tone, and computes the brightness difference and a color tone difference, While adjusting said drive current supplied to the light emitting device corresponding to each color tone by said 1st current adjustment 61R, 61G, and 61B By adjusting said amendment current supplied based on the brightness difference and color tone difference which were computed in said brightness and color tone difference calculation process in said 2nd current adjustment section 65, and adding to said drive current In the amendment process which amends each pixel brightness and a color tone to criteria brightness and a criteria color tone, and said amendment process The amendment data storage process of storing in said image display device the amendment data about control of the drive current supplied to said light emitting device of each color tone for every pixel, In case 1 image frame which makes VSYNC a frame signal is divided into plurality, and is used as an image transfer frame and image display actuation is performed based on the same image data with each image transfer frame, it sets on the image transfer frame of at least 1. It is the process which supplies the amendment current which performs the brightness and color tone amendment based on said amendment data to the light emitting device corresponding to one or more color tones besides the above, and is added to said drive current. While supplying the amendment current for amending the color tone and brightness of a light emitting device of any one color tone within the image transfer frame of 1 to the light emitting device of any other one color tone In order to amend

the color tone of any one light emitting device for every image transfer frame, it consists of a process which performs the color tone amendment and brightness amendment to a light emitting device of two or more color tones by changing the amendment current supplied to any other one light emitting device by time sharing.
[0023]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained based on a drawing. However, the gestalt of operation shown below does not illustrate the image display device and its control approach for materializing the technical thought of this invention, and this invention does not specify an image display device and its control approach as the following.
[0024] Furthermore, this specification has appended the number corresponding to the member shown in the gestalt of operation to the member shown in "the column of a claim", and "the column of The means for solving a technical problem" so that it may be easy to understand a claim. However, there is never nothing what specifies the member shown in a claim as the member of the gestalt of operation.
[0025] The image display control approach of this invention is explained below. This approach is the image display control approach which carries out multicolor luminescence, when the light emitting devices LR, LG, and LB corresponding to two or more color tones RGB control each amount AR, AG, and AB of luminescence of said light emitting devices LR, LG, and LB for every pixel based on the image data DR, DG, and DB concerning RGB in the display 10 arranged for every pixel.
[0026] LED etc. is used for a light emitting device. RGB of red, green, and blue adjoins per three pieces, arranges each light emitting diode which can emit light, respectively, and constitutes 1 pixel from the following examples. LED which RGB was made to adjoin for every pixel can realize a full color display. This invention is not restricted to this configuration, but approaching and arranging two colors can also merely arrange two or more LED per Isshiki.
[0027] An example of the pixel which consisted of light emitting devices LR, LG, and LB corresponding to two or more color tones RGB which can be set to drawing 1 at a display 10 is shown. although here showed the example which 1 pixel consists of with three light emitting diodes corresponding to a picture element (dot) -- RGB -- even if few each, a full color display is attained by consisting of 1 or more dots. In this example, the anode terminal of each light emitting device is connected common to one common source line, and the cathode terminal of the light emitting devices LR, LG, and LB of each RGB is connected to each current Rhine. The amount of luminescence of light emitting devices LR, LG, and LB is controlled by the drive current supplied to for example, current Rhine. Thus, light emitting devices LR, LG, and LB are arranged for every pixel, and it is considering as the display 10, and by the amount of currents and/or drive time amount of a drive current which are supplied to each based on image data DR, DG, and DB, by controlling the amounts AR, AG, and AB of luminescence, multicolor luminescence is carried out and image display control is realized.
[0028] Amount A'k of luminescence of a light emitting device Lk (k!=i) which hits an amended part mentioned later can be made to emit light in the same time amount as the luminescence time amount of a light emitting device Li at this time. However, if it is a time lag within the limits by which an after-image remains in human being's eyes, it is not necessary to make light emit in the same luminescence time amount.
[0029] In order to prevent dispersion in the chromaticity of each pixel resulting from manufacture dispersion of each light emitting device in this invention The light emitting device Li (i=R) concerning any one color tone at least among RGB of each pixel In case G and B are made to emit light based on image data Di, everything but this pixel, making the light emitting device Lk (k!=i) of at least one color tone emit light in the amount Ak of luminescence according to image data Dk -- in addition It controls to make amount A'k of luminescence to a light emitting device Lk according to the amount Ai of luminescence of a light emitting device Li emit light further, to unite and to emit light in amount Ak+A'k of luminescence.
[0030] An example of the control approach of amount A'k of luminescence added to the amount Ak of luminescence to which the light emitting device Lk (k!=i) of one color tone emits light below according to image data Dk is explained.
[0031] In this example, it considers as the amount of luminescence which multiplied Ai by the partition ratio [as opposed to each color tone for amount A'k of luminescence to the light emitting device Lk according to the amount Ai of luminescence of a light emitting device Li]. Here, a partition ratio is expressed that the partition ratios of R and G are bR and bG, respectively. [as opposed to gB gR, and B in the partition ratio of B and R] [as opposed to rG rB, and G in the partition ratio of G and B to R] That is, when the amounts of luminescence of each light emitting device LR, LG, and LB based on image data DR, DG, and DB are AR, AG, and AB, in the image display control approach of this invention, last amount A"R of luminescence of each light emitting device LR, LG, and LB, A"G, and A"B are controlled to become the amount of luminescence which added A'R, A'G, and A'B to AR, AG, and AB, respectively. Amount A"R of luminescence, A"G, and A"B are expressed with the following formulas.

[0032]
[Equation 1]

$$\begin{bmatrix} A''_R \\ A''_G \\ A''_B \end{bmatrix} \simeq \begin{bmatrix} A_R + A'_R \\ A_G + A'_G \\ A_B + A'_B \end{bmatrix} = \begin{bmatrix} 1 & g_R & b_R \\ r_G & 1 & b_G \\ r_B & g_B & 1 \end{bmatrix} \begin{bmatrix} A_R \\ A_G \\ A_B \end{bmatrix}$$

[0033] Therefore, although the amount Ai (i=R, B, G) of luminescence of each light emitting device Li (i=R, B, G) showed one output characteristics by the conventional image display control approach to the image data Di (i=R, B, G) which corresponds, respectively With the image display control approach of this invention, it is each light emitting device Li (i=R). Amount A"i of luminescence of B and G (i=R, B, G) will not become settled in one output characteristics to the corresponding image data Di (i=R, B, G), but will be dependent also on the amount Ak (k!=i) of luminescence corresponding to the image data Dk (k!=i) of the light emitting device Lk (k!=i) of other color tones.
[0034] Next, an example of the setting approach of amount A'k of luminescence added to the light emitting device Lk according to the amount Ai of luminescence of a light emitting device Li is explained. when light emitting diode (LED) is used as a light emitting device, in order [for example,] to amend chromaticity dispersion resulting from wavelength dispersion or optical output property dispersion of the LED -- image data Di (i=R, B, G) -- the amount of luminescence of the light emitting device Lk (k!=i) of other color tones is set up so that the chromaticity of the pixel corresponding to each maximum may be made into a criteria chromaticity. It is desirable to choose three chromaticities which can be expressed as a criteria chromaticity to all the combination of production dispersion of LED of each RGB within the limits here.
[0035] A concrete example of the selection approach of a criteria chromaticity is explained using the chromaticity diagram of drawing 2 . Field deltaSi (i=R, B, G) which shows the range of chromaticity dispersion at the time of making LED of each RGB emit light in the amount AiMax of the maximum luminescence (i=R, B, G) according to the maximum DiMax of the image data of the color tone corresponding to the chromaticity-diagram top of drawing 2 (i=R, B, G) is drawn. At drawing 2 , each field deltaSi is typically displayed with the polygon. At this time, it is possible that all LED is distributed in this deltaSi field (field shown with a slash in drawing 2 , respectively).
[0036] The top-most vertices of this deltaSi field are connected, and a triangle is formed. Top-most vertices where the area of the triangle formed on the intersection of each top-most vertices serves as min from the top-most vertices of deltaSi field of each RGB are chosen. Each top-most-vertices S'R of the minimum triangle **S'RS'GS'B which the intersection of selected top-most vertices forms, S'G, and S'B are chosen as a criteria chromaticity of each RGB. That is, all the chromaticities in triangle **S'RS'GS' area B can be expressed by choosing S'R, S'G, and S'B as a criteria chromaticity.
[0037] Thus, if the criteria chromaticity of each color is set up, the chromaticity of the chromaticity which can be expressed even if it is the combination of which LED within the limits (inside of triangle **S'RS'GS' area B) can be expressed. Amendment of a chromaticity can be performed by making the color of other color tones emit light. By this, chromaticity display dispersion between each pixel can be reduced remarkably, and chromaticity dispersion in the same LED unit 1 can be prevented.
[0038] in drawing 2 , for convenience, since [of explanation] the range of chromaticity dispersion is exaggerated and expressed, the chromaticity range which can be displayed by the display 10 becomes small -- as -- being visible (it reducing to the field of triangle **S'RS'GS'B from the field shown with the wavy line of drawing 2) -- even if it compares a LED display with CRT, it has the property that the color expression range is sufficiently large, and the chromaticity expression range of the display which applied this invention to the LED unit is still large than CRT Moreover, when a chromaticity is amended as an amount of luminescence which multiplied the amount Ai of luminescence for amount A'k of luminescence added to LED of other color tones by the partition ratio, amendment will be continuously performed to all chromaticities within the limits, and chromaticity dispersion can be prevented not only in the field near the RGB but in all color range.
[0039] moreover -- here -- the light emitting device Li (i=R and G --) of each RGB of each pixel In case B) emits light based on image data Di, in the amount Ak of luminescence of the light emitting device according to image data Dk also about the light emitting device Lk (k!=i) of which other color tones of this pixel Although the image display control approach to control was shown as an example so that light might be emitted in amount Ak+A'k of luminescence which added amount A'k of luminescence to the light emitting device Lk according to the amount Ai of luminescence of a light emitting device Li You may control to emit light in amount Ak+A'k of luminescence which added amount A'k of luminescence to the light emitting device Lk according to the amount Ai of luminescence of Li to the amount Ak of luminescence of the light emitting device according to the image data Dk of the light emitting device Lk (k!=i) of other one or more color tones of this pixel.

[0040] For example, if the color differential threshold on a chromaticity diagram is taken into consideration, since it is insensible to the chromaticity difference of the direction of B as compared with the direction of G, human being's eyes may be controlled by the field of R to emit light in amount AG+A'G of luminescence which added amount A'G of luminescence according to the amount AR of luminescence of LED of R only to LED of G. Moreover, since dispersion in a chromaticity is large as compared with LED of R or B, LED of G which now consists of a gallium nitride system compound semiconductor may be controlled to perform luminescence of R and/or amount A'R of luminescence of LED of B, amount AR+A'R of luminescence that added A'G, and/or AG+A'G only to luminescence of LED of G, as long as dispersion in LED of R and B is small enough. However, human being's eyes may be made to amend a chromaticity from the color differential threshold of area B being small sensitive to a chromaticity difference to LED of B as chromaticity dispersion of LED of B being small even if. Of course, it is not limited to the above-mentioned example whether amendment of the chromaticity of which LED of RGB is omitted, its chromaticity dispersion of the light emitting device of which chromaticity is large, or it can choose suitably according to the configuration of the color differential threshold in the chromaticity field.

[0041] Moreover, said light emitting device LR based on the image data DR, DG, and DB about RGB [when controlling image display by the amount of drive currents and/or drive time amount which supply control of the amounts AR, AG, and AB of luminescence of LG and LB to said light emitting devices LR, LG, and LB] It is desirable to control by increasing the drive current which supplies amount A'k of luminescence added according to the amount Ai of luminescence of a light emitting device Li to a light emitting device Lk to a light emitting device Lk. In each pixel, it is because control of the amount of luminescence is performed to coincidence in the same drive time amount of each light emitting device and a flicker of a display can be suppressed to the minimum.

[0042] Although the example which used LED as a light emitting device was shown here, it is suitable to the image display device which does not limit a light emitting device to LED in this invention, but chromaticity dispersion produces for every light emitting device.

[0043] In addition, when a correlation is between amendment of brightness dispersion, and amendment of chromaticity dispersion and it considers amendment of an image display device, it is important in the case of chromaticity dispersion amendment to perform brightness dispersion amendment to coincidence.

[0044] Light emitting diode can use the semi-conductor light emitting device in which various luminescence is possible. As a semiconductor device, what used semi-conductors, such as GaP, GaAs, GaN, InN and AlN, GaAsP, GaAlAs, InGaN, AlGaN, AlGaInP, and InGaAlN, for the luminous layer is mentioned. Moreover, the thing of terrorism structure is mentioned to the gay structure where the structure of a semi-conductor also has MIS junction, PIN junction, and a PN junction, hetero structure, or double.

[0045] By whenever [ingredient or its mixed-crystal], the luminescence wavelength of a semi-conductor light emitting device can be variously chosen from ultraviolet radiation to infrared light. [of a semi-conductor layer] Furthermore, in order to give the quantum effectiveness, it can also consider as the single quantum well structure and multiplex quantum well structure which used the luminous layer as the thin film.

[0046] The light emitting diode by combination with the fluorescent material which is excited by this not only with the three primary colors of RGB but with the light from an LED chip, and emits light can also be used. In this case, white can consider as the light emitting diode which linearity can be good and can emit light using one kind of light emitting device by using the fluorescent material which it is excited by the light from light emitting diode, and is changed into long wavelength.

[0047] Furthermore, the thing of various configurations can be used for light emitting diode. While specifically connecting electrically the LED chip which is a light emitting device to a lead terminal, the thing using the shell mold covered with mold resin etc., the chip type LED, etc. and the light emitting device itself is mentioned.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EXAMPLE

[Example] Hereafter, the example of a configuration concrete about the gestalt of operation of this invention is explained.
[0049] The rough block diagram of an example of the image display device applied to this invention at [example 1] drawing 3 is shown. The image display device shown in this drawing shows the example applied to the LED unit which displays by dividing one image into two or more image fields. The image display device shown in drawing 3 A display 10 and the amendment data storage section 32, With the amendment data control section 31 connected to the amendment data storage section 32, and the communications department 33 connected to the amendment data control section 31 The current feed zone 14 connected to the amendment data control section 31, and the brightness amendment section 13, It consists of the chromaticity amendment section 11, the image input section 19 which receives the image data inputted from the outside, the drive time amount control section 12 into which image data is inputted from the image input section 19, the address-generation section 18, and a common driver 17.
[0050] The image display device of the invention in this application can display a dynamic image and a static image by displaying the screen of 30 or more frames as an image frame in 1 second. Rather than the image display which used the Braun tube, the image display device which generally uses a light emitting device makes a refresh rate high, and makes [many] the count of an image frame display per second. In drawing 3 , 10 is the display 10 which displays the image corresponding to the image field specified among the divided image fields. 1 pixel is constituted, two or more pixels are arranged by the combination of each LED of RGB corresponding to three color tones in the shape of [of a m line xn train] a matrix, and a display 10 is constituted.
[0051] The amendment data which need the amendment data storage section 32 for amendment of the brightness of a display 10 and a chromaticity are memorized. As the amendment data storage section 32, storage elements, such as RAM, and a flash memory, EEPROM, are used. Various kinds of amendment data required for image amendment are memorized by the amendment data storage section 32. For example, white balance amendment data and field brightness amendment data required in order to control the predetermined amount of currents supplied for every color tone in the current feed zone 14 which are data, Pixel brightness amendment data required in order to amend brightness for every dot in the brightness amendment section 13, [required in order to amend a chromaticity for every pixel in the chromaticity amendment section 11] The chromaticity amendment data about a part of predetermined drive current which should be distributed to the light emitting device corresponding to other one or more color tones to the drive current supplied to the light emitting device corresponding to one color tone etc. are memorized by the amendment data storage section 32.

[0052] The amendment data control section 31 calls the various amendment data memorized by the amendment data storage section 32, and writes them in the current feed zone 14, the brightness amendment section 13, and the chromaticity amendment section 11, respectively.
[0053] The inputted image data is inputted into the drive time amount control section 12 through the image input section 19 from the outside. The current of the amount of currents amended by the current feed zone 14 and the brightness amendment section 13 is supplied to the drive time amount control section 12, drive time amount is controlled by pulse width based on image data for the supplied drive current, and it inputs into the chromaticity amendment section 11 as a pulse drive current. In addition, the drive time amount control section 12 may control the chromaticity amendment section 11 not by pulse width but by the count of a drive of a fixed pulse etc. in this case.
[0054] The chromaticity amendment section 11 amends further the pulse drive current inputted from the drive time amount control section 12. The chromaticity amendment section 11 amends the pulse drive current supplied to each LED based on chromaticity amendment data, in order to amend the chromaticity difference by chromaticity dispersion for every LED.

[0055] The address-generation section 18 generates the address which shows the line corresponding to the inputted synchronizing signal Hs, and inputs it into the common driver 17, the amendment data control section 31, and the drive time amount control section 12. The common driver 17 drives the line corresponding to the inputted address. Moreover, the chromaticity amendment section 11 serves as the segment driver, combines with the common driver 17, drives [the train corresponding to the drive time amount control section 12 is driven, and] one pixel to time sharing, and realizes a matrix display.
[0056] Next, brightness amendment and chromaticity amendment of a display 10 are explained. In the current feed zone 14, the drive current supplied to the brightness amendment section 13 from the current feed zone 14 is amended for every RGB based on the white balance amendment data and field brightness amendment data which were memorized by the amendment data storage section 32. Thus, the white balance and field brightness of the LED unit 1 whole are amended, and dispersion for every LED unit is prevented.
[0057] In the brightness amendment section 13, the drive current supplied to each LED is amended for every RGB which is a pixel based on the pixel brightness amendment data memorized by the amendment data storage section 32 for every RGB of each pixel. Thus, the brightness of each pixel is adjusted and dispersion in the brightness for every pixel in the same LED unit 1 is prevented.
[0058] In the chromaticity amendment section 11, the pulse drive current supplied to the amendment data storage section 32 from the drive time amount control section 12 based on the chromaticity amendment data memorized for every RGB of each pixel is amended for every RGB which is a pixel. Thus, the chromaticity of each pixel is amended, and while each color tone of RGB of each LED unit doubles with a reference value, dispersion in the chromaticity for every pixel in the LED unit 1 is also reduced sharply.
[0059] Therefore, it becomes possible to prevent dispersion not only in dispersion in the brightness for every LED unit, and a chromaticity but the brightness for every pixel in the same LED unit and a chromaticity by this invention.
[0060] Moreover, after the drive current first supplied to each LED corresponding to the color tone of each RGB based on white balance amendment data and field brightness amendment data was amended in the current feed zone 14, the brightness amendment section 13 and the chromaticity amendment section 11 -- setting -- each of each pixel — by amending a drive current according to an individual, amendment becomes possible for each [, such as white balance amendment, field brightness amendment, pixel brightness amendment, and pixel chromaticity amendment,] element of every.
[0061] Next, the chromaticity amendment section 11 is explained. In the chromaticity amendment section 11, a part of predetermined drive current supplied to LED of each color tone is distributed to the drive current of other color tones based on the chromaticity amendment data beforehand memorized to each pixel. That is, the drive current over B is distributed to LED of R and G which constitute the same pixel at LED of B and R from which the drive current over G constitutes the same pixel in LED of G and B from which the drive current over R constitutes the same pixel, respectively. A part of predetermined drive current which should be distributed, respectively is defined by setting up a partition ratio as for example, chromaticity amendment data. The partition ratio of the pulse drive current to LED of other color tones is set up beforehand, and chromaticity amendment data are memorized by the storage section for every color tone which is a pixel so that the chromaticity at the time of driving LED of one color tone of each pixel with a predetermined pulse drive current may be equivalent to the criteria chromaticity.
[0062] The partition ratio of G and B to R is set to rG and rB here, respectively, the partition ratio of B and R to G is set to gB and gR, respectively, and the partition ratio of R and G to B is set to bR and bG, respectively. Moreover, the amount of charges supplied to light emitting devices LR, LG, and LB based on image data DR, DG, and DB is set to QR, QG, and QB, respectively. Furthermore, it is the amount of charges applied according to the amount of luminescence of other light emitting devices, respectively Q'R When Q'G and Q'B, the total of amount Q"R of charges, Q"G, and Q"B which are supplied, respectively is expressed by the light emitting devices LR, LG, and LB of a certain pixel by the following formulas.
[0063]
[Equation 2]

$$\begin{bmatrix} Q''_R \\ Q''_G \\ Q''_B \end{bmatrix} = \begin{bmatrix} Q_R + Q'_R \\ Q_G + Q'_G \\ Q_B + Q'_B \end{bmatrix} = \begin{bmatrix} 1 & g_R & b_R \\ r_G & 1 & b_G \\ r_B & g_B & 1 \end{bmatrix} \begin{bmatrix} Q_R \\ Q_G \\ Q_B \end{bmatrix}$$

[0064] The amount of luminescence of a light emitting device is controllable by controlling the above-mentioned amount of charges. Here, the amounts of drive currents to the light emitting devices LR, LG, and LB of a certain pixel supplied from the current feed zone 14 are IR, IG, and IB, respectively, and when the drive time amount which performs a gradation expression based on each image data DR, DG, and DB is controlled as TR,

TG, and TB, the amounts QR, QG, and QB of charges and Q'R, Q'G, and Q'B are expressed with the following formulas.

[0065]

[Equation 3] Qi=IiTi (i=R, G, B), Q'i=sigma (k!=i) ikIkTk (ik=rG, rB, gB, gR, bR, bG)

[0066] This situation is explained based on drawing 4 . For example, when the pulse drive current of RGB supplied from the drive time amount control section 12 based on each image data DR, DG, and DB of a certain pixel is expressed with (a), (b), and (c) in drawing 4 , respectively, It is amended in the chromaticity amendment section 11, and the last pulse drive current supplied to LED of each RGB of this pixel can be expressed with (d) of drawing 4 , (e), and (f). At this time, amount Q"R of charges, Q"G, and Q"B which are supplied to LED of each RGB of this pixel are expressed with the area surrounded as the continuous line. That is, in this example, luminescence of the light emitting device LB corresponding to the color tone of B will be performed also in the drive time amount TR and TG of the light emitting devices LR and LG of other color tones not only based on the drive time amount TB based on image data DB but the image data DR and DG. That is, amount Q"i of charges finally supplied serves as the amount of charges which added amount Q'i of charges equivalent to the part surrounded with the slash of drawing 4 to the original amount Qi of charges.

[0067] In the above example, amount Q'k (k!=i) of charges distributed showed the example added between the drive time amount Ti based on the image data Di of other color tones. However, you may make it this invention add amount Q'k of charges distributed to time amount shorter than the drive time amount Ti based on image data Di. It is because the amount of charges which should be distributed needs to control the amount kili of drive currents which should be distributed with high precision in order to perform amount Q'k of charges roughly distributed between the drive time amount Ti based on image data Di compared with the basic amount of charges.

[0068] The schematic diagram of the chromaticity amendment section 11 is shown in drawing 5 . In the chromaticity amendment section 11, distribution block 111a of each RGB, b and c and synthetic block 112a, and b and c are allotted. Each distribution block 111a, and b and c have the chromaticity amendment data storage section which memorizes a partition ratio, and distribute the pulse drive current supplied from the drive time amount control section 12 corresponding to RGB to each synthetic block 112a, and b and c based on the memorized chromaticity amendment data. And in synthetic block 112a of each RGB, and b and c, the light emitting device which the pulse drive current distributed from each distribution block 111a, and b and c is compounded with an original pulse drive current, and each compounded pulse drive current should drive is supplied. Although it is also possible to make the partition ratio for all pixels memorize, and to constitute, as for this chromaticity amendment data storage section, it is desirable by rewriting the data of partition ratio storage memory dynamically for every pixel and every line as 1 pixel or memory space for one line to reduce memory space. In order to realize this configuration, the chromaticity amendment data storage section of the chromaticity amendment section 11 is made into the chromaticity amendment data temporary storage section, and it constitutes from a register, RAM, etc.

[0069] The example which similarly constituted the chromaticity amendment data storage section with the register of the capacity for one line with one shift register equivalent to the capacity for one line in drawing 6 is shown. Drawing 6 is illustrating only the part about R and this drawing is a schematic diagram showing R distribution block 111a and R composition block 112a. The chromaticity amendment data rG and rB to the line for a drive are held at the register in R distribution block 111a. A distribution circuit distributes the pulse drive current which should be distributed to LED of G and B based on the chromaticity amendment data rG and rB held at the register to synthetic block 112b of G and B, and c (not shown to drawing 6). In addition to the original pulse drive current supplied from the drive time amount control section 12, R composition block 112a compounds similarly the pulse drive current distributed to LED of R from distribution block 111b of G and B, and c, and supplies it to LED of R which is a pixel for a drive.

[0070] The chromaticity amendment data of the following line are inputted into a shift register while a sequential shift is carried out by the clock signal CLK through the chromaticity amendment data line DATA for every rG and rB. And according to the switch timing to the following line, by the latch signal LATCH, chromaticity amendment data are transmitted to a register and the chromaticity amendment data of the following line for a drive are held at a register. Thus, circuitry can be simplified by inputting carrying out the sequential shift of the chromaticity amendment data with a shift register. Although the example as which chromaticity amendment data are inputted into juxtaposition for every rG and rB was shown here, the shift register corresponding to the chromaticity amendment data rG and rB may be connected and constituted in a serial.

[0071] [An example 2], next the example 2 which are other examples of this invention are explained.

[0072] The pulse drive current of 1 image frame time supplied to drawing 7 at the light emitting devices LR, LG,

and LB in an example 2, respectively is shown. In this specification, an image frame points out the section which displays the image data for one screen, and between the pulses of VSYNC (Vertical Synchronizing signal) which serves as a frame signal in the chart shown in the maximum upper case of drawing 7 hits 1 image frame time. Here, the image frame time corresponding to 1 image frame of the video signal corresponding to one color tone is divided, and the driving pulse by which pulse width control was carried out corresponding to image data is assigned to each. The amount of luminescence is controlled by making a part of the divided image frame time into predetermined time amount, and supplying a part to the pulse drive current over the light emitting device of other color tones. Here, the drive time amount TR, TG, and TB based on each image data DR, DG, and DB of the image frame to which the width of face of each field surrounded by the line corresponds shall be set up for simplification of drawing. Moreover, the reference clock which is a RF is used so that the drive time amount control section 12 can perform a gradation expression in the divided image frame time.

[0073] As an example, the pulse drive current of the light emitting device LR corresponding to R is explained. A part of image frame time into which 1 image frame was divided is changed for the pulse drive current supplied, respectively to light emitting devices LG and LB, and it is supplied to them. In drawing 7 , the pulse of the tail of image frame time is replaced mutually, respectively. By this, amount A'R of luminescence according to the amounts AG and AB of luminescence to the light emitting devices LG and LB of other color tones can be added to the amount AR of luminescence of the light emitting device corresponding to R in the drive time amount of 1 image frame. At this time, the amount of luminescence according to color tone dispersion for every light emitting device can be applied controlling the count of the pulse drive current to replace, or by controlling the amount of drive currents.

[0074] Also in an example 2, like an example 1, the data about the count or the amount of drive currents of the pulse drive current which is chromaticity amendment data and to replace are memorized, and a distribution circuit generates the pulse drive current according to chromaticity amendment data in the chromaticity amendment data storage section of each distribution block 111a, and b and c, and supplies it suitably at each synthetic block 112a, and b and c.

[0075] [Example 3] The example 3 which is an example of further others is explained.

[0076] The example of the pulse drive current supplied to the light emitting devices LR, LG, and LB in an example 3 at drawing 8 , respectively is shown. Here, the drive time amount corresponding to 1 image frame of the video signal corresponding to one color tone is divided into three. By making one of the divided time amount of the into the main display period, the pulse drive current of the color tone corresponding to a light emitting device is supplied, two drive time amount which others divided is made into a color correction period, and amount A"k of luminescence added by supplying the pulse drive current of other color tones is controlled. Here, the drive time amount TR, TG, and TB based on each image data DR, DG, and DB of the image frame to which each field surrounded by the line corresponds shall be set up. In this example, drive time amount is shortened by fully taking drive time amount and setting up reference clock width of face small about the pulse drive current of other color tones by setting reference clock width of face as light emitting devices LR, LG, and LB greatly about the pulse drive current based on the image data DR, DG, and DB corresponding to each. Thus, the amount of luminescence according to the amount of luminescence to the light emitting device of one color tone can be applied to the amount of luminescence of the light emitting device of other color tones in the drive time amount of 1 image frame. At this time, the ratio of reference clock width of face, i.e., the frequency of a reference clock, is controlled, or the amount of luminescence according to dispersion for every light emitting device can be applied by controlling the amount of drive currents.

[0077] In an example 3, the drive time amount control section 12 has the chromaticity amendment data storage section, and controls each drive time amount based on the data about the frequency ratio of the reference clock which is chromaticity amendment data. And in the chromaticity amendment section 11, each pulse drive current is changed to the light emitting device which should be supplied according to the exchange timing of a pulse drive current.

[0078] the above-mentioned examples 1-3 — RGB -- although it explained that chromaticity amendment was performed also about which light emitting device, the chromaticity amendment section should just distribute a part of predetermined drive current supplied to the light emitting device corresponding to any one color tone at least among two or more color tones if needed to the light emitting device corresponding to other one or more color tones.

[0079] As mentioned above, the amendment data storage section 32 was constituted in the LED unit, and the chromaticity amendment section 11 showed the example controlled directly based on the chromaticity amendment data memorized by said amendment data storage section 32. However, as for the image display control approach of the invention in this application, it is possible to also make the brightness and color tone dispersion information on a light emitting device corresponding to an indicative data reflect by forming an

indicative data into many bits using the approach of picture signal processing. However, signal processing becomes complicated in this case, and gradation control of high resolution and coexistence of highly precise brightness amendment or chromaticity amendment are difficult. Furthermore, in the case of the large-sized display constituted by the small unit by dividing like a LED display, since amendment data are put on the signal-processing part which carries out package control of the indicative data, the dispersion data of a light emitting device and a light emitting device will exist separately, and management of data becomes difficult at it at the time of maintenance check like [when exchanging some units]. Therefore, as the image display control approach of an LED unit, the approach of controlling directly is desirable.

[0080] The [chromaticity amendment approach which is image display device] The control approach of the image display device of this invention is explained as an example 4 below. Drawing 9 is the conceptual diagram of the chromaticity amendment system used for the control approach of the image display device of this invention. The system shown in this drawing consists of brightness and chromoscope 42 which is connected to the LED unit 1, the brightness and chromaticity compensator 41 which are connected to the LED unit 1, and brightness and a chromaticity compensator 41, and detects the luminescence reinforcement of the LED unit 1.

[0081] A chromaticity amendment system carries out lighting control of each dot of the LED unit 1 with brightness and the chromaticity compensator 41. It is arranged and the luminescence detector on the strength which has a photo detector corresponding to two or more color tones is connected so that luminescence from the LED unit 1 may be received by the light sensing portion of a luminescence detector on the strength as brightness and chromoscope 42. With brightness and chromoscope 42, brightness and the chromaticity compensator 41 read the data of the chromaticity of LED unit 1 each pixel, and brightness, and computes each average of the LED unit 1 whole. And the drive current supplied from the current feed zone 14 is amended for every RGB so that it may be in agreement with the reference value of the white balance to which each of the average value was set beforehand, and field brightness. The correction value for every RGB of each pixel is calculated by matrix operation from the reference value of brightness and a chromaticity. Moreover, coincidence is asked also for dot correction value and chromaticity correction value. The amendment data about this control are memorized by the amendment data storage section 32 as white balance amendment data and field brightness amendment data through the communications department 33 in the LED unit 1 shown in drawing 3 .

[0082] Next, brightness and the chromaticity compensator 41 read the brightness data of each dot of the LED unit 1 driven according to the drive current conditions amended with said set point. And the brightness amendment section 13 of drawing 3 controls a drive current for every dot in agreement with the reference value with which the brightness in each dot was set up beforehand. The pixel brightness amendment data about this control are memorized by the amendment data storage section 32 as pixel brightness amendment data through the communications department 33 in the LED unit 1.

[0083] Furthermore, it is made to drive, without distributing LED corresponding to each color tone RGB in the chromaticity amendment section 11 according to the pulse drive current amended for every RGB of each pixel by each pixel of the LED unit 1. And each chromaticity is computed for every pixel from the light-receiving reinforcement of the photo detector corresponding to two or more color tones. Furthermore, the chromaticity and criteria chromaticity which were computed for every pixel by the light emitting device of each color tone are measured. The chromaticity of each pixel is amended by the light emitting device of each color tone by controlling the pulse drive current which brightness and the chromaticity compensator 41 distribute in the chromaticity amendment section 11 of the LED unit 1 based on the chromaticity difference of the chromaticity and criteria chromaticity which were computed for every pixel. Brightness and the chromaticity compensator 41 make the amendment data storage section 32 memorize the chromaticity amendment data about the drive current distributed to LED of other color tones as chromaticity amendment data for every pixel through the communications department 33 in the LED unit 1 for every pixel from the drive current supplied to LED of each color tone. In addition, it is better than the reference value of brightness and a chromaticity also as a configuration which asks coincidence for brightness correction value and chromaticity correction value by calculating the correction value for every RGB of each pixel by matrix operation.

[0084] The above-mentioned amendment approach is an example for explaining this system, it is repeating this process two or more times, and it cannot be overemphasized that the convergence value of amendment can be made highly precise more. Moreover, effective effectiveness is acquired, even if it starts an amendment process from chromaticity amendment and pixel brightness amendment, field brightness amendment, white balance adjustment, and a procedure contrary to the above adjust it. Moreover, although various amendment data were explained by the approach of memorizing separately in this invention like chromaticity amendment data, pixel amendment data, field brightness amendment data, and white balance amendment data, it is also possible to carry out batch processing for every pixel, and to memorize as amendment data for every pixel.

[0085] [Example 5] The image display device of the example 5 of this invention is explained further again. In this example, while supplying and carrying out brightness control of the main currents to LED which constitutes the pixel of arbitration, it carries out by adding the amendment current for chromaticity amendment to LED which constitutes other pixels, and combining chromaticity amendment.
[0086] That is, in order that the light emitting device of three colors may amend the color tone of the light emitting device of each color, i.e., dispersion of a chromaticity, in the configuration connected to the drive circuit, in this invention, to the light emitting device of the color for chromaticity amendment, very small lighting of the light emitting device of other two colors is carried out, and chromaticity amendment is performed. For example, when carrying out chromaticity amendment of the red, chromaticity amendment of a red light emitting device is performed by adding an amendment current to a green and/or blue light emitting device. Similarly, red and blue amendment current addition are performed about green chromaticity amendment, and red and green amendment current addition are performed by time sharing about blue chromaticity amendment, respectively.
[0087] Drawing 10 is the block diagram showing notionally the configuration of the LED display unit concerning the image display device of an example 5. The image display device of drawing 10 is equipped with the display 10 which arranged two or more LED in the shape of a matrix to every pixel L, the mechanical component 50 which drives LED of a display 10, and the drive control section 51 which transmits various control data to a mechanical component 50. A mechanical component 50 is set to vertical-drive section 50A from level mechanical-component 50B. Vertical-drive section 50A is the common driver 17, and level mechanical-component 50B is LED driver 50b.
[0088] In the image display device of drawing 10 , image data, brightness amendment data, chromaticity amendment data, etc. are transmitted to a mechanical component 50 from the drive control section 51. In this image display device, the dynamic drive is performed directly. The drive control section 51 controls the common driver 17 which is vertical-drive section 50A, and is performing the current supply change to LED connected to each common line on the LED dot matrix whose common driver 17 is a display 10.
[0089] Two or more steps are connected and LED driver 50b which is level mechanical-component 50B supplies a current to LED connected to the line chosen by the common driver 17.
[0090] An example of the circuitry of the image display device of an example 5 is shown in drawing 11 . The level mechanical component shown in drawing as LED which is a light emitting device LR, LG, and LB, It connects with such LED respectively. The 1st three current mechanical component 52 in which the drive control according to individual is possible, It has the three lighting pulse generating sections 63R, 63G, and 63B which are connected to the 2nd current mechanical component 53 which supplies an amendment current to each LED, the 1st current mechanical component 52, and the 2nd current mechanical component 53, and input a lighting pulse. The lighting pulse generating section 63 of each LED is connected to the 2nd current mechanical component 53 through the selector 54. A selector 54 is a selector which chooses the input from each point LGT pulse generating section 63, and is outputted to the 2nd current mechanical component 53, and can control the amendment current of each LED by the 2nd current mechanical component 53 of 1 to time sharing. The 1st current mechanical component 52 supplies an amendment current based on the lighting pulse as which the 2nd current mechanical component 53 was chosen by the selector 54 while carrying out brightness amendment of each LED based on the lighting pulse, and, as for the circuit of this configuration, chromaticity amendment of each LED is performed.
[0091] [Example 6] The example of a configuration is shown for the image display device of the example 6 of this invention in drawing 12 further again. It connects with a light emitting device, respectively, and the 1st current mechanical component 52 shown in this drawing supplies main currents based on image data. For said every light emitting device Two or more 1st constant current mechanical components 60 in which the drive control according to individual is possible, It has the main current switch 62 which is connected to a serial between the 1st current adjustment section 61 which is connected to the 1st constant current mechanical component 60, and adjusts the output current of the 1st constant current mechanical component 60, the 1st constant current mechanical component 60, and a light emitting device, and controls the current supply source to a light emitting device.
[0092] The 1st constant current mechanical component 60 shown in drawing 12 is connected with each LED through the main current switches 62R, 62G, and 62B, respectively. ON/OFF control of each main current switch 62 is performed by the lighting pulse generation sections 63R, 63G, and 63B connected with each main current switch 62, respectively. The lighting pulse generation section 63 generates a lighting pulse by Pulse Density Modulation (Palse Width Moduration) based on the indicative data which received from the drive control section 51. The lighting pulse generation section 63 adds this lighting pulse as an ON/OFF control signal of each main current switch 62, and performs drive control of the main currents in each 1st constant current mechanical component 60.

[0093] In addition, although the main current switch 62 shown in drawing 12 is connected to the serial between the 1st constant current mechanical component 60 and a light emitting device, the location of the main current switch 62 is not restricted to this. For example, the main current switch 62 can also be formed between the 1st constant current mechanical component 60 and the 1st current adjustment section 61. Moreover, the PWM control based on the lighting pulse from the lighting pulse generation section 63 is not restricted to the configuration performed with the main current switch 62, either, but can also be performed in the 1st constant current mechanical component 60 or the 1st current adjustment section 61.
[0094] Moreover, in order to perform chromaticity amendment of each LED further, it has the drive circuit of drawing 12 with the 2nd constant current mechanical component 64 and the 2nd current adjustment section 65 connected to the 2nd constant current mechanical component 64. By this configuration, performing a constant current drive by the 1st constant current mechanical component 60 about the main currents which control the brightness of each LED, an amendment current is added to LED other than the chromaticity from which the 2nd constant current mechanical component 64 serves as a candidate for amendment to the LED concerned further, and chromaticity amendment is performed. The 2nd current adjustment section 65 separately prepared for the 2nd constant current mechanical component 64 adjusts the value of the amendment current to add.
[0095] The 1st current adjustment section 61 and the 2nd current adjustment section 65 consist of DA converters for current adjustment. that is, -- the example of drawing 12 — per pixel -- the D/A converter (DAC) for brightness amendment of one circuit, and the D/A converter for chromaticity amendment — providing — **** -- each color — individual control is enabled.
[0096] The 2nd current mechanical component 53 can be formed according to an individual per RGB each color, and can also be considered as the configuration which can perform chromaticity amendment of each color to coincidence, and can make the 2nd current mechanical component 53 common to RGB, and can also perform chromaticity amendment of each color by time sharing. In the example of drawing 12 , the 2nd one current adjustment section 65 is connected to juxtaposition to the 2nd three constant current mechanical component 64. The number of the 2nd current adjustment sections 65 required for supply of an amendment current can be reduced by this. however, every — it is possible to prepare two or more current regulator circuits required for supply of an amendment current, such as to consider as the configuration which prepares the 2nd current adjustment section in the 2nd constant current mechanical component, respectively, and to also make two or more chromaticity amendment currents supply to coincidence.
[0097] The 2nd current adjustment section 65 determines an output current value, and the 2nd constant current mechanical component performs chromaticity amendment by adding this to the main currents of each color as an amendment current for chromaticity amendment. The 2nd current adjustment section 65 adjusts about the current value added by the 2nd constant current mechanical component 64. For example, when amending R (red), the 2nd constant current mechanical component 64 for G (green) and B (blue) is also driven, respectively by the lighting pulse signal which the lighting pulse generation section 63 for red generates. And while supplying main currents to red LED, red chromaticity amendment is performed by passing an amendment current to green and blue LED, and making these turn on. The same means also performs chromaticity amendment of other colors. For example, red and a blue amendment current are added to green chromaticity amendment, and red and a green amendment current are added to blue chromaticity amendment.
[0098] Consequently, when making RGB turn on as 1 pixel, the amendment current of other two colors will be added to LED of each color to main currents, respectively. For example, in red LED, the main currents for red lighting, the amendment current for green amendment, and the amendment current for blue amendment flow. Main currents and the amendment current for chromaticity amendment are compounded by each 2nd current mechanical component.
[0099] The image display device of the above example 6 has the following configurations.
(1) It has the 1st current adjustment section 61 which controls the main currents of each color according to an individual. Based on the gradation data received from the drive control section 51, the gradation pulse width of the lighting pulse generation section 63 is determined, and main currents are supplied to LED from the 1st constant current mechanical component 60 during this pulse shelf-life.
(2) The image display device of an example 6 is further inputted into the 2nd constant current mechanical component 64 of other two colors by making into a drive control signal the lighting pulse generated in the lighting pulse generation section 63 about LED for chromaticity amendment. And the amendment current for predetermined chromaticity amendment is made to add to the main currents of LED which hits an amendment color based on the 2nd current adjustment section 65.
[0100] According to such a description, in the image display device of an example 6 While adjusting the main currents outputted by the 1st constant current mechanical component 60 and the 1st current adjustment section 61 in the mechanical components 50 of red, green, and blue LED It becomes possible to perform

chromaticity amendment of each color LED and to make dispersion in an individual into homogeneity by carrying out drive control of the amendment current added to main currents, by the 2nd constant current mechanical component 64 and the 2nd current adjustment section 65.
[0101] The image display device concerning [an example 7], next the example 7 of this invention is shown in drawing 13 . LR, LG, and LB whose constant current drive circuit of drawing 13 is LED of RGB, The output sections OUTR, OUTG, and OUTB and the lighting pulse generation sections 63R, 63G, and 63B which were connected to each LED, It has 1st current adjustment DA converter 61AR which is the 1st current adjustment section 61, 61AG, 61AB, 2nd current adjustment DA converter 65A that is the 2nd current adjustment section 65, and the amendment current switches 1-SW 6 and the switch control section 66 which constitute the 2nd constant current mechanical component 64. The concrete configuration of the image display device concerning an example 7 is explained referring to the constant current drive circuit for the chromaticity amendment shown in drawing 13 hereafter.
[0102] the output section of LED by which the constant current drive circuit shown in drawing 13 controls 1 pixel — each RGB — it constitutes from the three output sections, OUTR, OUTG, and OUTB. The constant current drive of each output section presupposes that it is controllable according to an individual. At this example, adjustment of the brightness of each LED is performed by the gradation control by Pulse Density Modulation. Specifically a gradation reference clock (GCLK) is inputted into the lighting pulse generation sections 63R, 63G, and 63B, Pulse Density Modulation is performed based on gradation data (DATAs 1-3), and the lighting section is controlled. By this lighting pulse signal, the main currents passed in each output section are determined by 1st current adjustment DA converter 61AR, 61AG, and 61AB, and each output sections OUTR, OUTG, and OUTB are driven. Control data DAC_Data 1-4 is inputted and ******(ed) by 1st current adjustment DA converter 61AR, 61AG, 61AB, and the 2nd current adjustment DA converter65A, respectively. As control data DAC_Data 1-3, there are white balance amendment data, field brightness amendment data, pixel brightness amendment data, etc. here, and control data DAC_Data4 is chromaticity amendment data.
[0103] In this example, in order to carry out chromaticity amendment of the LED of the color of arbitration, in the same lighting section, an amendment current is added to other two colors, and it adjusts so that LED may serve as a predetermined chromaticity. That is, since it is necessary to add an amendment current to other two colors in order to amend one color, by three colors, addition of a total of six kinds of amendment currents is needed. The constant current drive circuit shown in drawing 13 is equipped with the amendment current switches 1-SW 6, and each amendment current switch SW is turned on by time sharing according to a chromaticity amendment selection signal.
[0104] An example of the timing diagram for chromaticity amendment actuation is shown in drawing 14 . 1 image frame which makes a frame signal VSYNC (Vertical Synchronizing signal) which shows the head of an image frame is divided into six, and this actuation uses it as an image transfer frame (Frame), transmits image data with the image transfer frames 1-6, and performs image display actuation. A flicker can be prevented by dividing 1 image frame into two or more image transfer frames, and performing the lighting display based on the same image data two or more times in each image transfer frame.
[0105] Chromaticity amendment actuation of each color is carried out for each [which was divided into six] image transfer frame of every. Each chromaticity amendment current value used as the candidate for chromaticity amendment is transmitted as chromaticity amendment current data with a front image transfer frame. That is, in the front image transfer frame, each chromaticity amendment current data is transmitted to 2nd current adjustment DA converter 65A, LED for chromaticity amendment is made to turn on the amendment current switch SW with an image [degree] transfer frame, and an amendment current is added. The amendment current switch SW performs addition control of an amendment current by time sharing according to a chromaticity amendment selection signal. An amendment current is added to LED other than LED for chromaticity amendment through the amendment current switch SW from the 2nd current adjustment DA converter65A. As mentioned above, the process which transmits the chromaticity amendment current data of a front image transfer frame, the process to which 2nd current-adjustment DA converter 65A supplies a chromaticity amendment current based on the chromaticity amendment current data transmitted with the front image transfer frame, and the process which turn ON the amendment current switch SW with which the switch control section 66 corresponds based on a chromaticity amendment selection signal are included in each image transfer frame which drawing 14 shows.
[0106] For example, R_g chromaticity amendment data show the chromaticity amendment current data for making G (green) emit light, in order to carry out chromaticity amendment of the LED of R (red). R_g chromaticity amendment data are transmitted with the image transfer frame 6, data are held with the following image transfer frame 1, and a chromaticity amendment current is reflected. PWM control is carried out by the lighting pulse generation section 63, while the amendment current switch SW3 is chosen by the chromaticity

amendment selection signal with the image [degree] transfer frame 1, being in ON condition and supplying an amendment current from current adjustment DA converter65A based on R_g chromaticity amendment current data. Thus, the chromaticity amendment current of G is added during the period which LED of R has turned on. Similarly, it processes in order to the image transfer frames 1-6, the amendment current switches 1-SW 6 are changed to time sharing, and chromaticity amendment of LED of all colors is performed at the image frame period of 1.

[0107] Although here showed the example which supplies the amendment current for LED chromaticity amendment in each image transfer frame, it can be set up suitably whether an amendment current is supplied in the number of image transfer frames and which image transfer frame. It is determined from a viewpoint of flicker prevention of an image display device whether to divide a 1 image frame into how many, and to set up the number of image transfer frames, and supply of an amendment current is based on the number of color tones of LED made to turn on for the number of color tones of LED to be used, or amendment. For example, the number of image transfer frames is set to 8, and you may make it supply an amendment current in six of image transfer frames [them].

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the conceptual diagram showing an example of the pixel which consisted of light emitting devices LR, LG, and LB corresponding to two or more color tones RGB which can be set in the image display section of this invention.
[Drawing 2] It is the conceptual diagram showing an example which chose the criteria chromaticity in this invention using the chromaticity diagram.
[Drawing 3] It is the block diagram showing the configuration of the image display device of this invention.
[Drawing 4] It is drawing having shown the synthetic example of the pulse drive current in the chromaticity amendment section of the example 1 of this invention.
[Drawing 5] It is the block diagram showing the configuration of the distribution section in the image display device of this invention.
[Drawing 6] It is the conceptual diagram having shown the flow of distribution of the drive current in the distribution section of this invention about R distribution block and R composition block.
[Drawing 7] It is drawing having shown the example of the pulse drive current of 1 image frame time in the chromaticity amendment section of the example 2 of this invention.
[Drawing 8] It is drawing having shown the example of the pulse drive current of 1 image frame time in the chromaticity amendment section of the example 3 of this invention.
[Drawing 9] It is the conceptual diagram of the chromaticity amendment system used for the chromaticity amendment approach of the image display device of the example 4 of this invention.
[Drawing 10] It is the block diagram showing the configuration of the display unit concerning the image display device of the example 5 of this invention.
[Drawing 11] It is the block diagram showing the configuration of the image display device of the example 5 of this invention.
[Drawing 12] It is the block diagram showing an example of the image display device of the example 6 of this invention.
[Drawing 13] It is the block diagram showing the configuration of the image display device of the example 7 of this invention.
[Drawing 14] The image display device of drawing 13 is the timing diagram which shows the actuation which performs chromaticity amendment.
[Description of Notations]
1 ... LED unit
L ... Pixel
LR, LG, LB ... Light emitting device
10 ... Display
11 ... Chromaticity amendment section
111a, b, a c...R distribution block, G distribution block, B distribution block
112a, b, a c...R composition block, G composition block, B composition block
12 ... Drive time amount control section
13 ... Brightness amendment section
14 ... Current feed zone
17 ... Common driver
18 ... Address-generation section
19 ... Image input section
31 ... Amendment data control section
32 ... Amendment data storage section

33 ... Communications department
41 ... Brightness and chromaticity compensator
42 ... Brightness and chromoscope
50 ... Mechanical component
50A ... Vertical-drive section
50B ... Level mechanical component
50 b...LED driver
51 ... Drive control section
52 ... 1st current mechanical component
53 ... 2nd current mechanical component
54 ... Selector
60 ... 1st constant current mechanical component
61 ... The 1st current adjustment section
61A, 61AR, 61AG, 61AB ... 1st current adjustment DA converter
62, 62R, 62G, 62B ... Main current switch
63, 63R, 63G, 63B ... Lighting pulse generation section
64 ... 2nd constant current mechanical component
65 ... The 2nd current adjustment section
65A ... 2nd current adjustment DA converter
66 ... Switch control section
OUTR, OUTG, OUTB ... Output section
SW1, SW2, SW3, SW4, SW5, SW6 ... Amendment current switch

[Translation done.]

* NOTICES *

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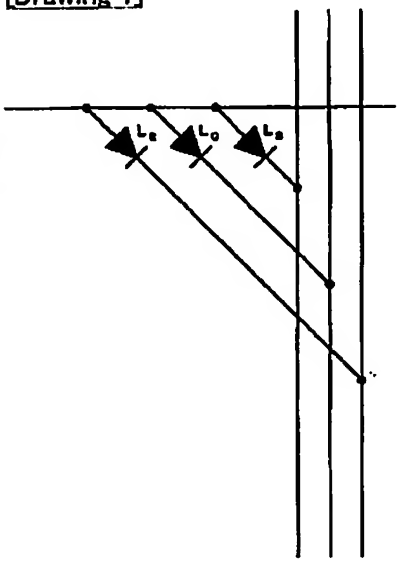
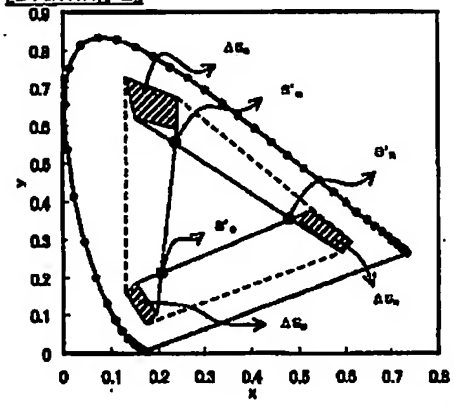
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

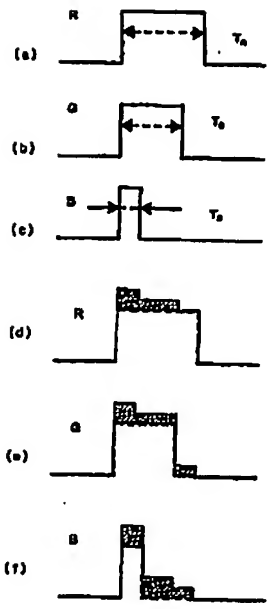
[Drawing 1]



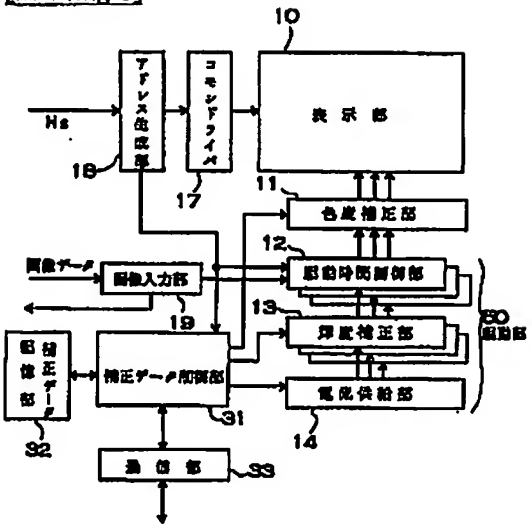
[Drawing 2]



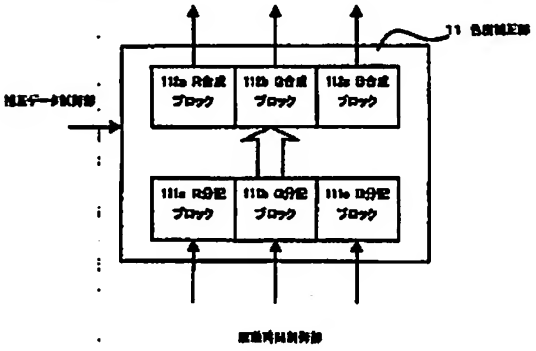
[Drawing 4]



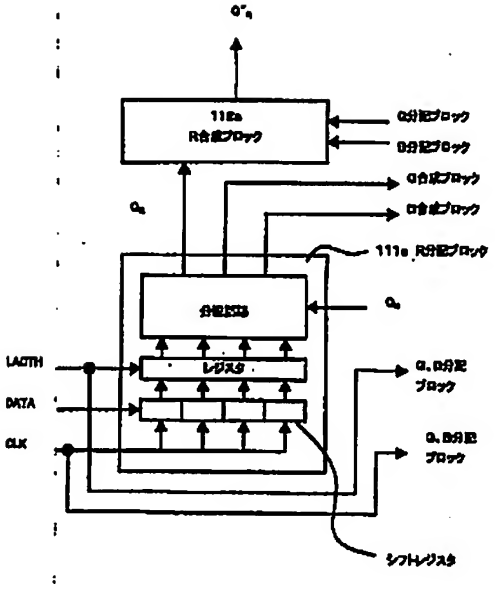
[Drawing 3]



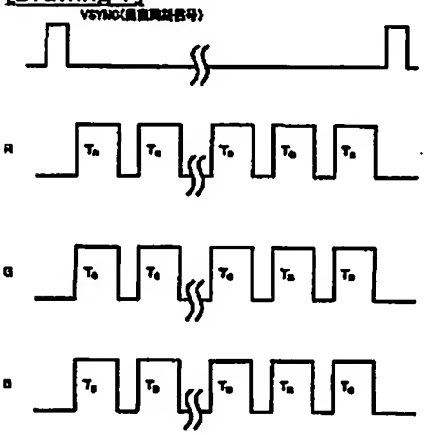
[Drawing 5]



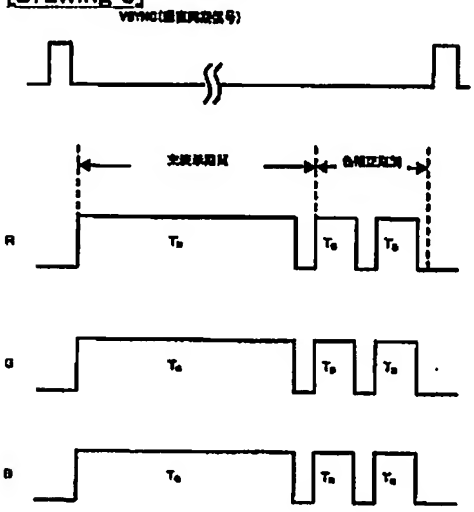
[Drawing 6]



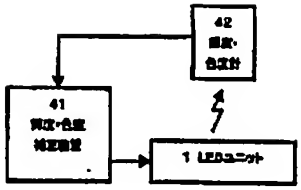
[Drawing 7]



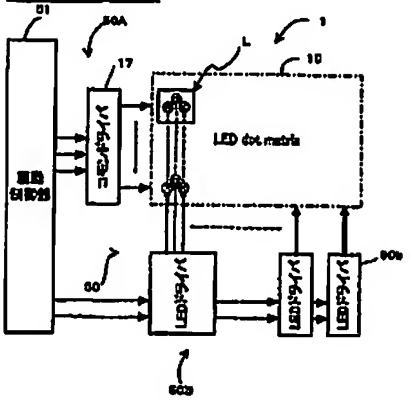
[Drawing 8]



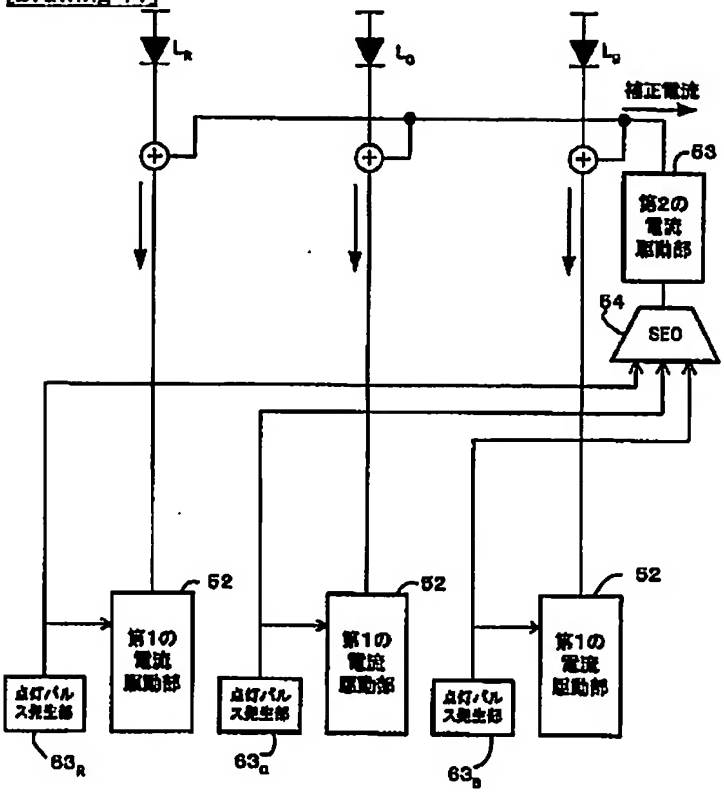
[Drawing 9]



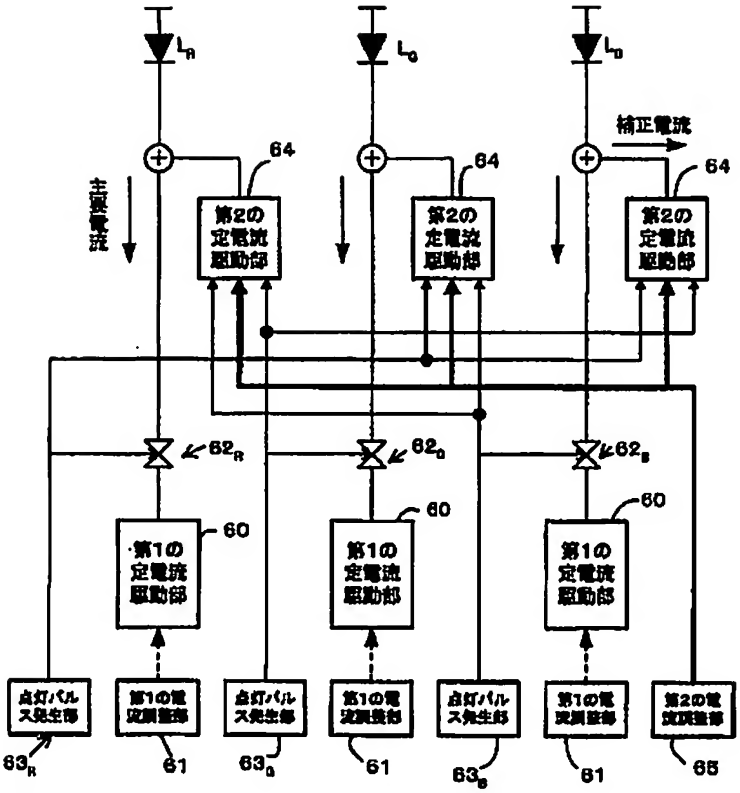
[Drawing 10]



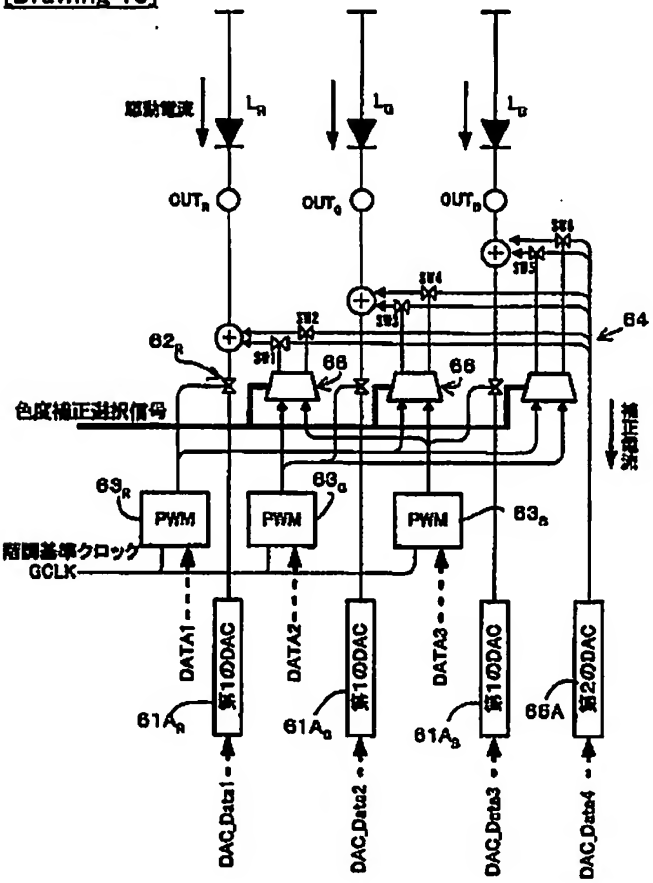
[Drawing 11]



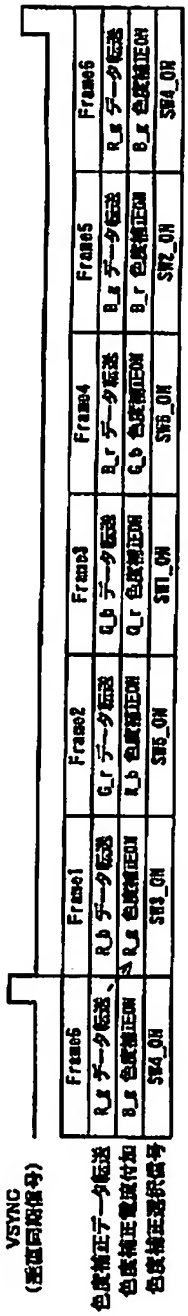
[Drawing 12]



[Drawing 13]



[Drawing 14]



[Translation done.]

CORRECTION OR AMENDMENT

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641 D
641 P
642 J

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[Filing Date] May 13, Heisei 15 (2003. 5.13)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] The image display device with which these main currents and this amendment current are controlled by pulse drive time amount in the image display device performed by adding the amendment current for chromaticity amendment to the light emitting device which constitutes other pixels, and combining chromaticity amendment while the light emitting device of two or more chromaticities supplies and carries out brightness control of the main currents to the light emitting device which it comes to arrange for every pixel and constitutes the pixel of arbitration.
[Claim 2] The image display device according to claim 1 characterized by carrying out very small lighting of the light emitting device of other two colors, and performing chromaticity amendment to the light emitting device of the color for chromaticity amendment in order that said pixel may consist of light emitting devices of three colors and may amend dispersion in the chromaticity of the light emitting device of each color.
[Claim 3] The light emitting device of three colors which said pixel consists of is red, blue, and a green image display device according to claim 2.
[Claim 4] The image display device according to claim 1 to 3 with which said main current and said amendment current are controlled by time sharing.
[Claim 5] The image display device according to claim 1 to 4 characterized by controlling accommodation of the

amount of luminescence by said main current and said amendment current by the ratio (criteria clock pulse width of face) of the count of a pulse drive of a pulse drive current, or/and the frequency of a reference clock.
[Claim 6] RGB, in case it comes to arrange the light emitting device of a chromaticity for every pixel and the light emitting device Li (i=R, G, B) of each RGB of each pixel emits light based on image data Di So that light may be emitted in amount Ak+A'k of luminescence which added amount A'k of luminescence to the light emitting device Lk according to the amount Ai of luminescence of Li to the amount Ak of luminescence of the light emitting device according to the image data Dk of the light emitting device Lk (k!=i) of other one or more chromaticities of this pixel The image display device which controls the ratio (criteria clock pulse width of face) of the count of a pulse drive of a pulse drive current, or/and the frequency of a reference clock.
[Claim 7] a setup of amount A'k of luminescence added to said light emitting device Lk according to the amount Ai of luminescence of said light emitting device Li -- image data Di (i=R, B, G) -- the image display device according to claim 6 characterized by setting up the amount of luminescence of the light emitting device Lk (k!=i) of other chromaticities so that the chromaticity of the pixel corresponding to each amount of the maximum luminescence may be made into a criteria chromaticity.
[Claim 8] The image display device control approach that these main currents and this amendment current are controlled by pulse drive time amount in the image display device performed by adding the amendment current for chromaticity amendment to the light emitting device which constitutes other pixels, and combining chromaticity amendment while the light emitting device of two or more chromaticities supplies and carries out brightness control of the main currents to the light emitting device which it comes to arrange for every pixel and constitutes the pixel of arbitration.
[Claim 9] In case the light emitting device Li (i=R, G, B) of each RGB of each pixel emits light based on image data Di So that light may be emitted in amount Ak+A'k of luminescence which added amount A'k of luminescence to the light emitting device Lk according to the amount Ai of luminescence of Li to the amount Ak of luminescence of the light emitting device according to the image data Dk of the light emitting device Lk (k!=i) of other one or more chromaticities of this pixel The image display device control approach which controls the ratio (criteria clock pulse width of face) of the count of a pulse drive of a pulse drive current, or/and the frequency of a reference clock.
[Claim 10] The image display device according to claim 1 to 7 with which said light emitting device consists of light emitting diode (LED).
[Claim 11] The image display device control approach according to claim 8 to 9 that said light emitting device consists of light emitting diode (LED).
[Claim 12] Time sharing by which said main current and said amendment current are controlled divides the drive time amount corresponding to 1 image frame into three. The pulse drive current of the chromaticity corresponding to a light emitting device is supplied by making into the main display period one of the time amount divided into three. this -- It is what controls the amount of chromaticity amendment luminescence applied by making into a color correction period two drive time amount which others divided, and supplying the pulse drive current of other chromaticities. The image display device according to claim 4 characterized by controlling adjustment of the amount of luminescence by this main current and this amendment current by setup of reference clock width of face.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0010
[Method of Amendment] Modification
[Proposed Amendment]
[0010]
[Means for Solving the Problem] In order to attain the above purpose, invention of this invention according to claim 1 While the light emitting device of two or more chromaticities supplies and carries out brightness control of the main currents to the light emitting device which it comes to arrange for every pixel and constitutes the pixel of arbitration In the image display device performed by adding the amendment current for chromaticity amendment to the light emitting device which constitutes other pixels, and combining chromaticity amendment, these main currents and this amendment current are the image display devices controlled by pulse drive time amount.
[Procedure amendment 3]
[Document to be Amended] Specification
[Item(s) to be Amended] 0011
[Method of Amendment] Modification
[Proposed Amendment]

[0011] Thus, while not being concerned with chromaticity dispersion of a light emitting device but making the chromaticity for every pixel into homogeneity by constituting, the image display device in which high amendment of a stable precision which can perform adjustment of brightness or a chromaticity, without the modulation of a chromaticity occurring is possible can be offered.
[Procedure amendment 4]
[Document to be Amended] Specification
[Item(s) to be Amended] 0012
[Method of Amendment] Modification
[Proposed Amendment]
[0012] Moreover, a flicker of the high display of precision can be prevented, controlling [make the light emitting device of other chromaticities emit light, amend so that the chromaticity of that light emitting device may be amended among two or more chromaticities during luminescence of the light emitting device of a certain chromaticity, or before and after luminescence, and] blurring of a chromaticity by this configuration.
[Procedure amendment 5]
[Document to be Amended] Specification
[Item(s) to be Amended] 0013
[Method of Amendment] Modification
[Proposed Amendment]
[0013] Invention according to claim 2 is the image display device which is made to carry out very small lighting of the light emitting device of other two colors, and performs chromaticity amendment to the light emitting device of the color for chromaticity amendment, in order that a pixel may consist of light emitting devices of three colors and may amend dispersion in the chromaticity of the light emitting device of each color.
[Procedure amendment 6]
[Document to be Amended] Specification
[Item(s) to be Amended] 0014
[Method of Amendment] Modification
[Proposed Amendment]
[0014] Three colors of invention according to claim 3 which a pixel consists of are red, blue, and a green image display device.
[Procedure amendment 7]
[Document to be Amended] Specification
[Item(s) to be Amended] 0015
[Method of Amendment] Modification
[Proposed Amendment]
[0015] Invention according to claim 4 is the image display device with which said main current and an amendment current are controlled by time sharing.
[Procedure amendment 8]
[Document to be Amended] Specification
[Item(s) to be Amended] 0016
[Method of Amendment] Modification
[Proposed Amendment]
[0016] Invention according to claim 5 is the image display device with which accommodation of the amount of luminescence by the main current and the amendment current is controlled by the ratio (criteria clock pulse width of face) of the count of a pulse drive of a pulse drive current, or/and the frequency of a reference clock.
[Procedure amendment 9]
[Document to be Amended] Specification
[Item(s) to be Amended] 0017
[Method of Amendment] Modification
[Proposed Amendment]
[0017] It comes to arrange the light emitting device of a chromaticity for every pixel. invention according to claim 6 -- RGB -- In case the light emitting device Li (i=R, G, B) of each RGB of each pixel emits light based on image data Di So that light may be emitted in amount Ak+A'k of luminescence which added amount A'k of luminescence to the light emitting device Lk according to the amount Ai of luminescence of Li to the amount Ak of luminescence of the light emitting device according to the image data Dk of the light emitting device Lk (k!=i) of other one or more chromaticities of this pixel It is the image display device which controls the ratio (criteria clock pulse width of face) of the count of a pulse drive of a pulse drive current, or/and the frequency of a reference clock.

[Procedure amendment 10]
[Document to be Amended] Specification
[Item(s) to be Amended] 0018
[Method of Amendment] Modification
[Proposed Amendment]
[0018] a setup of amount A'k of luminescence which adds invention according to claim 7 to the light emitting device Lk according to the amount Ai of luminescence of a light emitting device Li — image data Di (i=R, B, G) — it is the image display device which sets up the amount of luminescence of the light emitting device Lk (k!=i) of other chromaticities so that the chromaticity of the pixel corresponding to each amount of the maximum luminescence may be made into a criteria chromaticity.
[Procedure amendment 11]
[Document to be Amended] Specification
[Item(s) to be Amended] 0019
[Method of Amendment] Modification
[Proposed Amendment]
[0019] Invention according to claim 8 is the image display device control approach that main currents and an amendment current are controlled by pulse drive time amount, in the image display device performed by adding the amendment current for chromaticity amendment to the light emitting device which constitutes other pixels, and combining chromaticity amendment while the light emitting device of two or more chromaticities supplies and carries out brightness control of the main currents to the light emitting device which it comes to arrange for every pixel and constitutes the pixel of arbitration.
[Procedure amendment 12]
[Document to be Amended] Specification
[Item(s) to be Amended] 0020
[Method of Amendment] Modification
[Proposed Amendment]
[0020] In case the light emitting device Li (i=R, G, B) of each RGB of a pixel emits light based on image data Di, invention according to claim 9 So that light may be emitted in amount Ak+A'k of luminescence which added amount A'k of luminescence to the light emitting device Lk according to the amount Ai of luminescence of Li to the amount Ak of luminescence of the light emitting device according to the image data Dk of the light emitting device Lk (k!=i) of other one or more chromaticities of a pixel It is the image display device control approach which controls the ratio (criteria clock pulse width of face) of the count of a pulse drive of a pulse drive current, or/and the frequency of a reference clock.
[Procedure amendment 13]
[Document to be Amended] Specification
[Item(s) to be Amended] 0021
[Method of Amendment] Modification
[Proposed Amendment]
[0021] Invention according to claim 10 is the image display device with which a light emitting device consists of light emitting diode (LED).
[Procedure amendment 14]
[Document to be Amended] Specification
[Item(s) to be Amended] 0022
[Method of Amendment] Modification
[Proposed Amendment]
[0022] Invention according to claim 11 is the image display device control approach that a light emitting device consists of light emitting diode (LED). Moreover, time sharing by which a main current and an amendment current are controlled invention indicated to claim 12 The pulse drive current of the chromaticity corresponding to a light emitting device is supplied by making into the main display period one of the time amount divided into three. the drive time amount corresponding to 1 image frame — three — dividing — this — It is the image display device with which two drive time amount which others divided is made into a color correction period, the amount of chromaticity amendment luminescence applied by supplying the pulse drive current of other chromaticities is controlled, and adjustment of the amount of luminescence by this main current and this amendment current is controlled by setup of reference clock width of face.
[Procedure amendment 15]
[Document to be Amended] Specification
[Item(s) to be Amended] 0040

[Method of Amendment] Modification
[Proposed Amendment]
[0040] For example, if the color differential threshold on a chromaticity diagram is taken into consideration, since it is insensible to the chromaticity difference of the direction of B as compared with the direction of G, human being's eyes may be controlled by the field of R to emit light in amount AG+A'G of luminescence which added amount A'G of luminescence according to the amount AR of luminescence of LED of R only to LED of G. Moreover, since dispersion in a chromaticity is large as compared with LED of R or B, LED of G which now consists of a gallium nitride system compound semiconductor may be controlled to perform luminescence of R and/or amount A'R of luminescence of LED of B, amount AR+A'R of luminescence that added A'B, and/or AB+A'B only to luminescence of LED of G, as long as dispersion in LED of R and B is small enough. However, human being's eyes may be made to amend a chromaticity from the color differential threshold of area B being small sensitive to a chromaticity difference to LED of B as chromaticity dispersion of LED of B being small even if. Of course, it is not limited to the above-mentioned example whether amendment of the chromaticity of which LED of RGB is omitted, its chromaticity dispersion of the light emitting device of which chromaticity is large, or it can choose suitably according to the configuration of the color differential threshold in the chromaticity field.
[Procedure amendment 16]
[Document to be Amended] Specification
[Item(s) to be Amended] 0092
[Method of Amendment] Modification
[Proposed Amendment]
[0092] The 1st constant current mechanical component 60 shown in drawing 12 is connected with each LED through the main current switches 62R, 62G, and 62B, respectively. ON/OFF control of each main current switch 62 is performed by the lighting pulse generation sections 63R, 63G, and 63B connected with each main current switch 62, respectively. The lighting pulse generation section 63 generates a lighting pulse by Pulse Density Modulation (Pulse Width Modulation) based on the indicative data which received from the drive control section 51. The lighting pulse generation section 63 adds this lighting pulse as an ON/OFF control signal of each main current switch 62, and performs drive control of the main currents in each 1st constant current mechanical component 60.

[Translation done.]